

INSECTS OF HAWAII

INSECTS OF HAWAII

A Manual of the Insects of the Hawaiian Islands, including an Enumeration of the Species and Notes on their Origin, Distribution, Hosts, Parasites, etc.

ELWOOD C. ZIMMERMAN

VOLUME 11

DIPTERA: BRACHYCERA, FAMILY DOLICHOPODIDAE
CYCLORRHAPHA, SERIES ASCHIZA
FAMILIES LONCHOPTERIDAE, PHORIDAE,
PIPUNCULIDAE, AND SYRPHIDAE

DOLICHOPODIDAE

by D. Elmo Hardy and Marian Adachi Kohn

PHORIDAE

by D. Elmo Hardy and Erwin Beyer

LONCHOPTERIDAE, PIPUNCULIDAE, AND SYRPHIDAE

by D. Elmo Hardy

*The generous co-operation of the National Science Foundation
made possible the completion and publication of this volume.*



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PREFACE TO VOLUME 11

This volume deals with two hundred seventy-seven species (plus two subspecies) belonging in one family of the suborder Brachycera and four families of the suborder Cyclorrhapha: one hundred ninety-seven Dolichopodidae; one Lonchopteridae; nineteen Phoridae; thirty-six (plus two subspecies) Pipunculidae; and twenty-four Syrphidae. The family Dolichopodidae is second only to the Drosophilidae in number of endemic species, and, like the latter, many of the species are apparently restricted to specialized habitats and exhibit striking structural modifications. I am very appreciative of the help given me on this group by Mrs. Marian Adachi Kohn. She has done extensive work on the Hawaiian species and, besides her invaluable assistance with the taxonomy, she did most of the drawings for this section.

In dealing with the Hawaiian Phoridae I had reached a complete impasse; I had keyed and described the recognized species but found a series of species which I was unable to place in the literature. Mr. Erwin Beyer, Bad Godesberg, Germany, who at that time was studying under the proficient guidance of Father Hermann Schmitz, kindly consented to criticize my manuscript and to describe the new species from Hawaii. For this help I have given him junior authorship on the section treating the Phoridae; the new species are his. Mr. Beyer has a remarkably good knowledge of these flies and is well qualified for this study. He reviewed my manuscript and described the new species promptly but beyond this point there has been little contact with him. Mr. Beyer became ill about this time and his extended illness and probably other extenuating circumstances apparently prevented him from further collaboration on the Hawaiian Phoridae. I made many unsuccessful attempts to communicate with him concerning the taxonomy of our phorids. The drawings which Mr. Beyer submitted with his descriptions of the new species were not up to the standard which I had set for the illustrations in this volume. They are little more than rough sketches but I am assuming that they are accurate. I have not been able to have these redrawn since to the time of this writing the specimens (after four years) have still not been returned to me. The publication of this volume has already been delayed about three years and it is felt that supplemental drawings may have to be published after the types of the new species are returned.

This work has been made possible by a grant from the National Science Foundation. I am indeed grateful for this support.

I am very appreciative of the important help given to me by Dr. W. W. Wirth, Insect Identification and Parasite Introduction Research Branch, U. S. D. A.; R. L. Coe, British Museum (Natural History); Dr. J. R. Vockeroth, Canada De-

partment of Agriculture; Dr. Paul Arnaud, California Academy of Sciences; and Dr. B. R. Stuckenberg, Natal Museum.

The art work has been done over a period of about six years by the following artists: Mrs. Marian Adachi Kohn, Mr. Peter Dease, Mrs. Phyllis Habeck, Mrs. Paula Ingold Exton, Mrs. Hope Watson, and Mrs. Elizabeth Twigg-Smith Pfeffer. The excellence of these illustrations adds materially to the value of this volume and I am indebted to these collaborators for their assistance.

Honolulu, Hawaii

D. ELMO HARDY

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INSECTS OF HAWAII

CHECKLIST OF THE INSECTS IN THIS VOLUME

Order DIPTERA

Suborder BRACHYCERA

Family DOLICHOPODIDAE

Subfamily CAMPSICNEMINAE
Genus **CAMPSICNEMUS** Haliday

acuticornis Parent
aepus n. sp.
albitarsus n. sp.
amblytylus n. sp.
bellulus Van Duzee
bicoloripes Parent
bicrenatus n. sp.
biseta n. sp.
breviciliatus Parent
brevipes Van Duzee
brevitibia n. sp.
brunnescens n. sp.
bryophilus (Adachi)
calcaratus Grimshaw
calcaritarsus Adachi
camptoplax n. sp.
capitulatus n. sp.
carinatus n. sp.
chauliopodus n. sp.
ciliatus Van Duzee
clinotibia n. sp.
comatus n. sp.
compressus n. sp.
congregatus Malloch
coniculus n. sp.
contortus Parent
cracens n. sp.
crassipes n. sp.
crinitibia Van Duzee
crossotibia n. sp.
crossotus n. sp.
deficiens Parent
depauperatus Parent
diamphidius n. sp.
dicondylus n. sp.
diffusus n. sp.
disjunctus n. sp.
distinctus n. sp.
distortipes Grimshaw
divergens Van Duzee
dryoscartes n. sp.
ephydrus n. sp.

Hawaii	Maui	Molokai	Lanai	Oahu	Kauai	Other Localities
				X		
	X					
X						
				X		
				X		
		X				
		X				
				X		
				X		
X						
	X					
		X				
		X				
	X					
		X				
			X			
		X				
	X					
				X		
				X		
	X					
				X		
				X		
				X		
X			X			
X						
X						
X	X					

	Hawaii	Mau	Molokai	Lanai	Oahu	Kauai	Other Localities
<i>exiguus</i> n. sp.		×					
<i>eximius</i> n. sp.		×					
<i>ferrugineus</i> Parent	×						
<i>fimbriatus</i> Grimshaw	×						
<i>flavipes</i> n. sp.	×						
<i>flavithorax</i> n. sp.	×						
<i>flaviventer</i> n. sp.	×		×				
<i>flexuosus</i> Parent					×		
<i>fragilis</i> Parent					×		
<i>fulvifacies</i> n. sp.			×				
<i>fumipennis</i> Parent			×		×		
<i>furax</i> Parent					×		
<i>fusticulus</i> n. sp.	×						
<i>gloriosus</i> Van Duzee			×	×	×		
<i>goniochaeta</i> n. sp.	×						
<i>grimshawi</i> Van Duzee	×						
<i>haleakalae</i> (Zimmerman)		×					
<i>helvolus</i> n. sp.			×				
<i>hispidipes</i> n. sp.	×		×			×	
<i>hoplitipodus</i> Adachi	×				×		
<i>hygrophilus</i> n. sp.	×						
<i>impariseta</i> n. sp.	×						
<i>inaequalis</i> n. sp.	×						
<i>indecorus</i> n. sp.			×				
<i>inermipes</i> Malloch					×		
<i>insuetus</i> n. sp.						×	
<i>labilis</i> n. sp.		×					
<i>latipenna</i> n. sp.		×					
<i>lepidochaetes</i> n. sp.				×			
<i>longiciliatus</i> Parent					×		
<i>longitibia</i> n. sp.			×				
<i>loxothrix</i> n. sp.	×						
<i>macula</i> Parent	×	×			×		
<i>mediofloccus</i> n. sp.		×					
<i>membranilobus</i> Parent					×		
<i>mirabilis</i> (Grimshaw)					×		
<i>miritibialis</i> Van Duzee					×		
<i>miser</i> Parent					×		
<i>modicus</i> n. sp.	×						
<i>mucronatus</i> n. sp.		×					
<i>mundulus</i> n. sp.		×					
<i>nambai</i> n. sp.		×					
<i>nigricollis</i> Van Duzee						×	
<i>nigroanalis</i> Parent					×		
<i>norops</i> n. sp.						×	
<i>obscurus</i> Parent			×				
<i>olympicolus</i> Parent					×		

CHECKLIST

3

	Hawaii	Maui	Molokai	Lanai	Oahu	Kauai	Other Localities
ornatus Van Duzee					×		
pallidus Parent					×		
paniculatus n. sp.	×						
parvulus n. sp.	×						
patellifer Grimshaw					×		
penicillatus Parent	×		×				
perplexus n. sp.		×	×				
petaliconemus n. name			×				
pherocteis n. sp.						×	
philohydratus n. sp.		×					
planitibia Parent					×		
platystylatus n. sp.						×	
plautinus Adachi						×	
profusus n. sp.		×					
putillus Parent			×				
pynochaeta n. sp.	×						
rectus Malloch					×		
restrictus n. sp.				×			
rhyphopus n. sp.					×		
ridiculus Parent			×				
sciarus n. sp.				×			
scolimerus n. sp.	×						
setiger n. sp.	×						
silvaticus n. sp.	×						
simplicipes Parent			×				
sinuatus Van Duzee	×						
spinicoxa n. sp.	×						
tarsiciliatus Parent					×		
terracolus n. sp.	×						
tibialis Van Duzee	×						
truncatus n. sp.		×					
undulatus n. sp.		×					
uniseta n. sp.		×					
vafellus Parent					×		
viridulus n. sp.		×					
williamsi Van Duzee					×		
Genus EURYNOSTER Van Duzee							
aeruginosa n. sp.					×		
angustifacies n. sp.						×	
apicenigra Parent					×		
argentata n. sp.	×						
binodata Parent					×		
bullata n. sp.	×						
callaina n. sp.		×					
cilifemorata Parent					×		
clavastyla n. sp.						×	
clavatacauda Van Duzee					×		

	Hawaii	Mau	Molokai	Lanai	Oahu	Kauai	Other Localities
conspicua n. sp.					×		
crassicercus n. sp.						×	
dolichostoma n. sp.						×	
exartema n. sp.		×					
flavicrura n. sp.						×	
flaviventer n. sp.	×						
furva n. sp.			×				
fusticercus n. sp.						×	
gracilipennata n. sp.					×		
hamata n. sp.			×				
hawaiiensis (Grimshaw)	×						
hispida n. sp.	×	×					
incompta n. sp.					×		
kauaiensis n. sp.						×	
maculata Parent	×		×		×		
minor (Parent)					×	×	
multispinosa n. sp.			×				
nigripedis n. sp.		×					
nigrohalterata Parent					×		
nudata n. sp.					×		
obscurifacies Parent					×		
paludis n. sp.						×	
palustricola n. sp.						×	
parenti n. name						×	
pulverea n. sp.						×	
retrociliata Parent					×		
saxatilis (Grimshaw)					×		
spiniger (Grimshaw)		×		×			
subciliata n. sp.					×		
tanyceraea n. sp.			×				
tergoprolixa n. sp.			×				
variabilis n. sp.	×	×	×		×		
virida Van Duzee					×		
viridifacies Parent					×		
vittata n. sp.		×					
williamsi n. sp.			×				
xanthopleura n. sp.						×	
Subfamily CHRYSOSOMATINAE							
Genus CHRYSOSOMA							
Guérin-Ménéville							
fraternum Van Duzee	×	×	×	×	×	×	Midway and Kure Is.
palapes n. sp.					×		
pallidicornis (Grimshaw)	×	*	*	*	×	×	Formosa, Seychelle Is.
Genus SCIAPUS Zeller							
connexus (Walker)	×						Australia, Society Is.

*Not known to be established in Hawaii.

	Hawaii	Maui	Molokai	Lanai	Oahu	Kauai	Other Localities
Subfamily DIAPHORINAE							
Genus ASYNDETUS Loew carcinophilus Parent	•	×	×	•	×	×	
Genus CHRYŒOTUS Meigen pallidipalpus Van Duzee parthenus n. sp.	×	×	×	×	×	×	
Subfamily DOLICHOPODINAE							
Genus DOLICHOPUS Latreille exsul Aldrich	×	×	×	×	×	×	
Subfamily HYDROPHORINAE							
Genus HYDROPHORUS Fallén pacificus Van Duzee williamsi Parent	• ×	×	• ×	• •	×	×	Laysan Is.
Genus PARALIANCALUS Parent metallicus (Grimshaw)	×	×	×		×	×	
Genus PARAPHROSYLUS Becker acrosticalis (Parent)	×	×	×	×	×	×	Leeward islands of Hawaiian group
Genus SIGMATINEURUM Parent chalybeum Parent		×	×				
Subfamily MEDETERINAE							
Genus MEDETERA Fischer atrata Van Duzee cilifemorata Van Duzee	×				×	×	
Subfamily RAPHIINAE							
Genus SYNTORMON Loew distortitarsis Van Duzee	×	•	•	×	×	×	
Suborder CYCLORRHAPHA							
Series ASCHIZA							
Family LONCHOPTERIDAE							
Genus LONCHOPTERA Meigen furcata (Fallén)	×	×	×			×	Widespread over Europe, Asia, North and South America, and New Zealand

*Not known to be established in Hawaii.

	Hawaii	Maui	Molokai	Lanai	Oahu	Kauai	Other Localities
Family PHORIDAE							
Subfamily PHORINAE							
Genus CONICERA Meigen							
Subgenus Tritoconicera Schmitz							
hawaiiensis Colyer					×		
Genus DIPLONEVRA Lioy							
Subgenus Diplonevra Lioy							
peregrina (Wiedemann)	×	×			×	×	East Asia, S.W. Pacific, Australia
Subgenus Dohrniphora Dahl							
cornuta (Bigot)	×				×		Tropics and temperate regions of world
Subfamily METOPININAE							
Genus MEGASELIA Rondani							
Subgenus Aphiochaeta Brues							
setaria (Malloch)		×			×	×	Guam
Subgenus Megaselia Rondani							
brunneipalpata Beyer, n.sp.	×						
curtibarba Beyer, n. sp.					×		
furcatilis Beyer, n. sp.					×		
heterodactyla Beyer, n.sp.					×		
koffleri Schmitz		×			×		N. Africa, Middle East, S.W. Pacific
longibarba Beyer, n. sp.		×					
scalaris (Loew)	×	×	×	×	×	×	Cosmopolitan, except far north
zebrina Beyer, n. sp.					×	×	
Species No. 1	×						
Species No. 2	×				×		
Genus METOPINA Macquart							
ventralis Schmitz					×		Bismarck Archipelago
Genus PULICIPHORA Dahl							
Subgenus Puliciphora Dahl							
lucifera Dahl					×		Bismarck Archipelago
wymani Bohart					×		Samoa, Fiji
Genus CHONOCEPHALUS							Guam
Wandolleck							
pallidulus Beyer, n. sp.					×		
simiolus Beyer, n. sp.					×		
Family PIPUNCULIDAE							
Subfamily PIPUNCULINAE							
Genus PIPUNCULUS Meigen							
Subgenus Pipunculus Meigen							
acrothrix Perkins	×						

	Hawaii	Maui	Molokai	Lanai	Oahu	Kauai	Other Localities
<i>alienus</i> (Hardy)		×	×	×			
<i>alienus koolauensis</i> n. subsp.					×		
<i>amplus</i> n. sp.					×		
<i>apletomeris</i> n. sp.	×						
<i>bicuspidis</i> n. sp.						×	
<i>canutifrons</i> n. sp.	×						
<i>chaulio sternum</i> n. sp.						×	
<i>cornutus</i> (Hardy)					×		
<i>delomeris</i> n. sp.		×	×				
<i>euryhymenos</i> n. sp.						×	
<i>filicicolus</i> n. sp.					×	×	
<i>gnomus</i> n. sp.	×						
<i>haleakalae</i> (Hardy)		×	×				
<i>hawaiiensis</i> Perkins	×						
<i>holomelas</i> Perkins		×	×				
<i>injectivus</i> n. sp.	×						
<i>juvator</i> Perkins	×	×	×	×	×	×	
<i>juvator melanopodis</i> (Hardy)		×	×	×			
<i>juvencus</i> n. sp.	?	×					
<i>laterisutilis</i> n. sp.		×					
<i>macrothrix</i> n. sp.	×						
<i>megameris</i> n. sp.		×	×				
<i>molokaiensis</i> Grimshaw	×	×	×	×			
<i>nigrotarsatus</i> Grimshaw	×	×					
<i>oahuensis</i> Perkins					×		
<i>obscuratus</i> (Hardy)	×						
<i>obstipus</i> n. sp.		×					
<i>perkinsiellae</i> (Hardy)					×		
<i>proditus</i> n. sp.					×		
<i>rotundipennis</i> Grimshaw	×	?	?	?	?	?	
<i>sectus</i> n. sp.		×		×			
<i>swezeyi</i> Perkins					×		
<i>terryi</i> Perkins						×	
<i>timberlakei</i> (Hardy)	×	?			×		
<i>titanus</i> n. sp.		×					
<i>trichostylis</i> n. sp.		×					
<i>uluhe</i> (Hardy)	?	×	×	×			
Family SYRPHIDAE							
Subfamily SYRPHINAE							
Tribe SYRPHINI							
Genus ALLOGRAPTA Osten Sacken							
<i>*cubana</i> Curran							Cuba
<i>exotica</i> (Wiedemann)	×	×	×	—	×	×	Neotropical Region, California

—Probably present but no specimens have been seen from these Islands.

	Hawaii	Maui	Molokai	Lanai	Oahu	Kauai	Other Localities
obliqua (Say)	×	×	×	×	×	×	North and South America
Genus EUPEODUS Osten Sacken							
*volucris Osten Sacken							W. North America, Mexico
Genus ISCHIODON Sack							
grandicornis (Macquart)	×	×	×	—	×	—	Widespread over the Pacific.
Genus MESOGRAPTA Loew							
marginata (Say)	×	×	×	—	×	×	North and Central America
Genus METASYRPHUS Matsumura							
Subgenus <i>Posthosyrphus</i> Enderlein							North America, Central America, Colombia
*wiedemanni Johnson							
Genus SPHAEROPHORIA Lepeletier and Serville							
*sulphuripes (Thomson)							W. United States
Genus SYRPHUS Fabricius							
*opinator Osten Sacken							W. United States and Mexico
Tribe BACCHINI							
Genus BACCHA Fabricius							
*clavata (Fabricius)							North and South America
Tribe MELANOSTOMINI							
Genus MELANOSTOMA Schiner							
*stegnum (Say)							W. United States, Mexico
Subfamily EUMERINAE							
Genus EUMERUS Meigen							
aurifrons (Wiedemann)	×	×	—	×	×	×	Oriental region and S.W. Pacific
marginatus Grimshaw	×	—	—	—	×	×	Asia, S.W. Pacific
*strigatus (Fallén)							United States, Europe, N. Africa, Asia Minor
Subfamily VOLUCELLINAE							
Genus VOLUCELLA Geoffroy							
Subgenus <i>Ornidia</i> Lepeletier and Serville							
obesa (Fabricius)	×	×	×	×	×	×	Niihau Is., Hawaii; Neotropical; S. United States; Fiji, Tahiti, Samoa, Marquesas
Subgenus <i>Phalacromyia</i> Rondani							
dracaena Curran	×				×		Probably Central America

—Probably present but no specimens have been seen from these Islands.

	Hawaii	Maui	Molokai	Lanai	Oahu	Kauai	Other Localities
tricincta Bigot		×			×	×	Lower California
Subgenus Volucella Geoffroy							
tamaulipana Townsend	×	×	×	—	×	×	S. Texas and Mexico
Subfamily XYLOTINAE							
Genus SYRITTA Lepeletier and Serville							
aenigmatopatria n. sp.					×		
oceanica Macquart	×	×	×	—	×	×	Widespread over Pacific
orientalis Macquart	×	—	—	—	×	×	Pacific and Orient
Subfamily ERISTALINAE							
Tribe ERISTALINI							
Genus ERISTALIS Latreille							
Subgenus Eristalomyia Rondani							
tenax (Linnaeus)	×	×	—	×	×	—	Temperate regions and subtropics of the world
Subgenus Lathyrrophthalmus Scopoli							
aeneus (Scopoli)	—	—	×	—	×	—	Niihau Is., Hawaii; widespread over Nearctic, Palearctic regions; N. Africa, Middle East, Micronesia
arvorum (Fabricius)	×	×	×	×	×	—	Central, eastern, and south Asia; Pacific
Tribe HELOPHILINI							
Genus MERODON Meigen							
*equestris (Fabricius)							Europe, New Zealand, United States

—Probably present but no specimens have been seen from these Islands.

SUMMARY OF THE NEW NOMENCLATORIAL CHANGES MADE IN THIS VOLUME

DOLICHOPODIDAE

- Emperoptera* Grimshaw is a new synonym of *Campsicnemus* Haliday.
- Campsicnemus bryophilus* (Adachi), new combination for *Emperoptera bryophila* Adachi.
- Campsicnemus concavus* Van Duzee is a new synonym of *C. gloriosus* Van Duzee.
- Campsicnemus haleakalae* (Zimmerman), new combination for *Emperoptera haleakalae* Zimmerman.
- Campsicnemus mirabilis* (Grimshaw), new combination for *Emperoptera mirabilis* Grimshaw.
- Campsicnemus petalictenus*, new name for *C. arcuata* Adachi, 1953, *nec. arcuatus* Van Duzee, 1917.
- Campsicnemus flavicornis* Van Duzee, new synonym of *C. rectus* Malloch.
- Campsicnemus spinitibia* Van Duzee, new synonym of *C. tibialis* Van Duzee.
- Campsicnemus octosetosus* Van Duzee, new synonym of *C. williamsi* Van Duzee.
- Campsicnemus obtusus* Van Duzee, new synonym of *C. williamsi* Van Duzee.
- Uropachys* Parent, new synonym of *Eurynogaster* Van Duzee.
- Eurynogaster hawaiiensis* (Grimshaw), new combination for *Chrysotus hawaiiensis* Grimshaw.
- Eurynogaster nitida* Van Duzee, new synonym of *E. hawaiiensis* (Grimshaw).
- Eurynogaster parenti*, new name for *Pachyurus hawaiiensis* Parent, 1934, *nec E. hawaiiensis* (Grimshaw), 1901.
- Eurynogaster saxatilis* (Grimshaw), new combination for *Chrysotus saxatilis* (Grimshaw).
- Eurynogaster luteihalterata* Parent, new synonym of *E. saxatilis* (Grimshaw).
- Eurynogaster spiniger* (Grimshaw), new combination for *Chrysotus spiniger* Grimshaw.
- Chrysotus vulgaris* Van Duzee, new synonym of *C. pallidipalpus* Van Duzee.
- Aphrosylinae* Aldrich (in part, e.g., *Paraphrosylus* Becker), new synonym of *Hydrophorinae* Aldrich.
- Medetera hawaiiensis* Van Duzee, new synonym of *M. atrata* Van Duzee.

LONCHOPTERIDAE

- Lonchoptera dubia* Curran, new synonym of *L. furcata* (Fallén).

PHORIDAE

Megaselia stuntzi Bohart, new synonym of *M. setaria* (Malloch) .

Megaselia biformis Brues, new synonym of *M. koffleri* Schmitz.

PIPUNCULIDAE

Pipunculus vulcanus Perkins, new synonym of *P. nigrotarsatus* Grimshaw.

Pipunculus pyrophilus Perkins, new synonym of *P. rotundipennis* Grimshaw.

SYRPHIDAE

Volucella hoyae Curran, new synonym of *V. tricineta* Bigot.

Volucella timberlakei Curran, new synonym of *V. tamaulipana* Townsend.

Volucella feminina Curran, new synonym of *V. tamaulipana* Townsend.

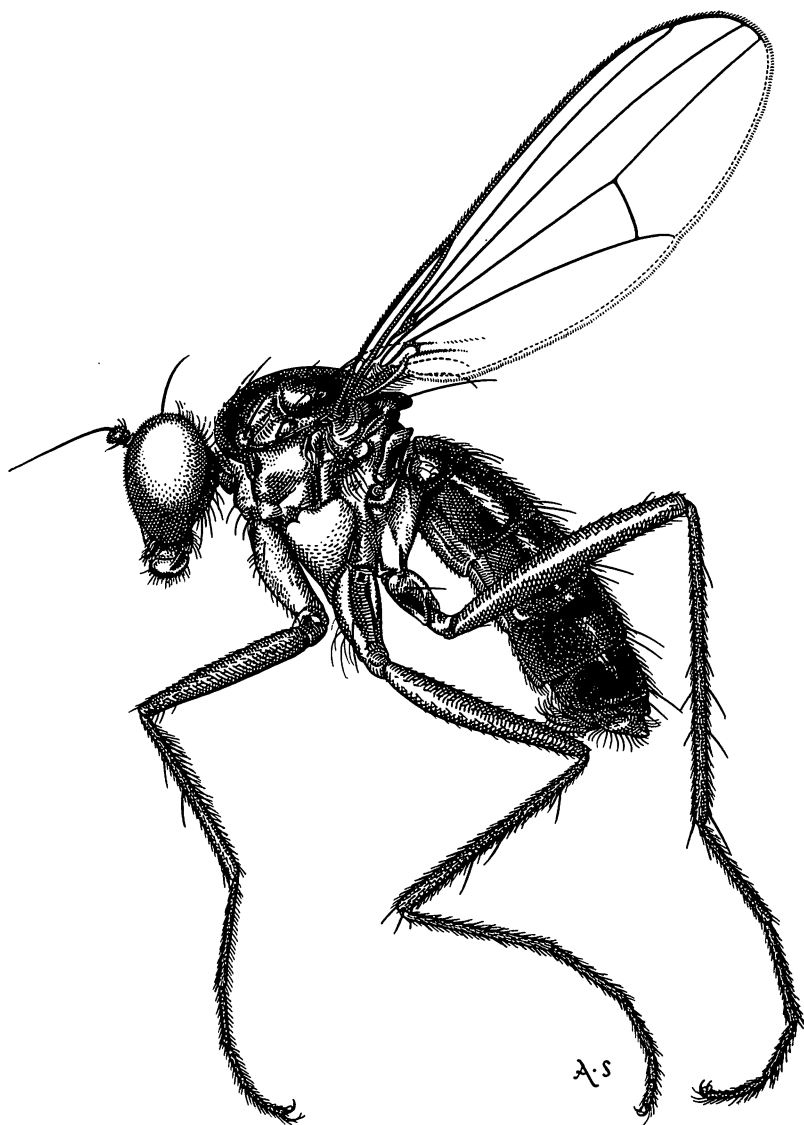


Figure 1—*Paraliancalus metallicus* (Grimshaw) : Type male.

Family DOLICHOPODIDAE Latreille
Long-legged Flies or Long-headed Flies

Dolichopides Latreille, 1807, Gen. Crust. Ins. 3:290.

Dolichopodes Latreille, 1809, Gen. Crust. Ins. 4:239.

Dolychopides Leach, 1815, in Brewster's Edinburgh Encyclopaedia 9:161.

Dolychopodae Samouelle, 1819, Entomologist's Useful Compendium, p. 294.

Dolichopides Billberg, 1820, Enum. Ins. in Mus. Billberg, Stockholm, Gadel 4:120.

Dolichopites Newman, 1834, Ent. Mag. 2:393.

Dolichopodidae Gerstaecker, 1864, Bericht Wissensch. Leistungen Geb. Ent. während des Jahre 1862, Berlin, p. 203.

Moderately small, slenderly built flies with long legs and elongate heads, usually metallic blue, green, or bronze, though many of the Hawaiian species are relatively dull. The adults of the Hawaiian species range in length from 1.2 mm. (*Chrysotus pallidipalpus* Van Duzee) to 8 mm. (*Paraliancalus metallicus* (Grimshaw)). The dolichopodids are differentiated from the other families of flies by having the r-m crossvein situated near the base of the wing, cell first M_2 combined with the medial cell, the cubital cell very short and poorly developed (fig. 67a), and the frontal lunule lacking, with no suture separating off the parafacials.

The head, in profile, is oval to oblong, higher than wide; eyes large, oval, and pubescent. The face, in some groups, is narrower in the males, often obliterated by the approximation of the eyes. The antennae are three-segmented with an apical, subapical, or dorsal arista; third segment usually somewhat ovate. The maxillary palpi are flat, unsegmented, and bristled, normally resting on the protruding mouth structures. The proboscis is retractable, short, and stout. The labella have five or six radiating, heavily sclerotized, rib-like areas which are used as grinding structures to crush the prey between the labella.

The thorax is convex on the dorsum, often with a conspicuous prescutellar depression. The dorsocentral bristles are well developed, ranging from two pairs in some of the Hawaiian Chrysosomatinae to ten or twelve pairs in some of our Hydrophorinae. The acrostichal bristles are uniserial, biserial, or absent. The legs are long and slender, generally longer than in other related families of brachycerous flies. (The family name comes from the Greek *dolichos*, long + *poda*, legs). The wing venation is rather simple, with the r-m crossvein located within the basal one-fifth of the wing.

In one group of *Campsicnemus* Haliday, the wings are greatly reduced, narrowed to a slender appendage composed of the costa and one to three longitudinal veins. These are flightless species, but their wing rudiments evidently help them to leap about on the ground. Other than these Hawaiian species, there are only two known species of flightless dolichopodids; both of them are recorded from the subantarctic islands of New Zealand and Australia. The first

species, *Schoenophilus pedestris* Lamb, from Macquarie Island, has the wings developed similarly to the Hawaiian species; the second, *Acropsilus borboroides* Oldroyd, from Campbell Island, is completely wingless, even lacking the halteres.

The male genitalia show great variation in this family. In the Hawaiian species, they range from rather tiny and inconspicuous, as in *Chrysotus* Meigen (fig. 65c) and *Hydrophorus* Fallén (fig. 67b), to very large, conspicuous and highly ornate as in *Chrysosoma* Guérin-Méneville (fig. 62d) and *Dolichopus* Latreille (fig. 66b).

Sexual dimorphism is quite pronounced in this family of flies. Females are sometimes difficult to identify because of the lack of apparent morphological differences. Secondary sexual characteristics of the male are especially noticeable in the tibiae, tarsi, femora, third antennal segment, and palpi. In *Syntormon* Loew, the third antennal segment is elongate and pointed in the males, short and oval in females; in some of the Hawaiian species of *Campsicnemus* the triangular third antennal segment is generally longer and acutely pointed at the apex in the males, short and rounded apically in the females. The males of some species have the long, setiform arista capitate at the apex, as in *Campsicnemus patellifer* Grimshaw and *Chrysosoma fraternum* Van Duzee. In *Chrysotus pallidipalpus* Van Duzee, a species common throughout the lowlands, the palpi of the male are its most prominent structures. These are pale yellow, in contrast to the dark green body, and they are large and pendulous, almost as long as the head. The legs are ornate in the males of some species, and this modification is especially striking in Hawaiian *Campsicnemus* Haliday and *Eurynogaster* Van Duzee. In *Campsicnemus* the middle tibia is often thickened, expanded, curiously contorted, or sinuous (fig. 13e); some have the middle basitarsus reduced to a short knob with a large terminal spur and the remaining tarsal segments normal (fig. 38b).

The dolichopodids are a large family of greatly diversified flies that live predominantly in moist situations. Of the more than two thousand known species, the greatest numbers occur in the tropical and subtropical regions of the world. Since collections generally contain material of limited geographical origin, many more species undoubtedly remain to be discovered. This is the second largest family of flies in Hawaii, and the genera *Campsicnemus* Haliday and *Eurynogaster* Van Duzee are especially well developed in our endemic fauna. Approximately a hundred species of *Campsicnemus* have been recorded previously for the entire world, about half of these from Hawaii; but herein we recognize 125 species in this genus from Hawaii alone.

Hawaiian species are found in a wide variety of habitats ranging from the seashore well into the mountains. The rocky coast just above and within the tidal zone is the chief habitat of *Paraphrosylus* Becker. When the tide is out, the rocks are often covered with these flies, wandering briskly about, exploring the newly exposed territory. Crab holes on sandy beaches are frequently haunted by *Asyndetus* Loew. Higher on shore, species of *Hydrophorus* may be found

running over the surface of salt or brackish pools. These rather large flies are common in our maritime marshes, though *H. pacificus* has been taken on fresh water pools quite a distance from the sea.

Dolichopus, *Syntormon*, and *Chrysotus* are found on vegetation and ground litter in wet places throughout the lowlands and in the mountains; they prefer open and sunny places and consequently are not associated with many of our native species which prefer shade. *Chrysosoma* Guérin-Méneville and *Sciapus* Zeller are found in bright sunlight on foliage. Individuals of *Medetera* Fischer are usually found on trunks of trees and posts.

Members of *Campsicnemus* and *Eurynogaster* are usually upland or forest species. At least sixteen species of the former are known to be water skaters on puddles and pools in the mountains (Williams, 1939:292). As discussed by Williams (*op. cit.*), the coloration of the Hawaiian dolichopodids appears to correlate rather closely with their ecological habitat. The species found along the forest trails are predominantly brown and rather dull; those found on water are usually brown to black; those found along the beaches are predominantly gray; and those that spend much of their time flitting on foliage in the sunlight are predominantly metallic green or blue.

Both larvae and adults are largely predaceous. The adults apparently feed by sucking the juices from soft-bodied animals after they are crushed or milled between the labella. (For a detailed study of the mouthparts see Cregan, 1941.) *Dolichopus exsul* Aldrich and possibly other species feed on both living and dead insects; Williams (1933:307) observed it feeding on dead mountain termites (*Neotermes connexus* Snyder). The larvae are pale, slender, and cylindrical, and move very rapidly. They are predominantly hydrophiles, living in various aquatic habitats along the edges of pools, in moss and algae in shallow water, or on banks kept wet by seepage; some are found under bark or in decaying vegetation. Little is known of the immature stages of the Hawaiian species.

Our knowledge of the Hawaiian dolichopodids is based entirely upon the works of Grimshaw (1901 and 1902), Aldrich (1922), Malloch (1932), Van Duzee (1933), Parent (1934, 1937, 1938, and 1939), Williams (1938 and 1939), Zimmerman (1938), and Adachi (1953 and 1954). To date, the majority of the species have been described by Parent and Van Duzee. The only biological information available is based on the outstanding studies of Williams (*op. cit.*). For an excellent review of the immature dolichopodids see Smith (1952).

KEY TO THE SUBFAMILIES AND GENERA OF HAWAIIAN DOLICHOPODIDAE

1. Wings normal2
 Wings aberrant, reduced to a slender lanceolate
 appendage (fig. 24e).....**Campsicnemus** Haliday (in part).
- 2(1). Vein M_{1+2} with a widely divergent fork beyond the
 m crossvein, vein M_1 angulate, strongly curved

- upward approaching vein R_{4+5} (fig. 62b). Hypopygium free, conspicuously developed (fig. 61h).
Chrysosomatinae3
 Vein M_{1+2} without such a fork.....4
- 3(2). Arista apical (fig. 61b).....**Chrysosoma** Guérin-Ménéville.
 Arista dorsal (fig. 62a).....**Sciapus** Zeller.
- 4(2). First antennal segment and posterior tarsus not bristled....5
 First antennal segment and posterior basitarsus also
 with stout bristles (fig. 65d). Hypopygium free,
 cerci large, lamellae-like. *Dolichopodinae*.....
 **Dolichopus** Latreille.
- 5(4). Crossvein m short, one-third or less than the length
 of the apical section of M_{3+4} (fig. 63b) *Diaphorinae*....6
 Crossvein m more than one-third or sometimes longer
 than the length of the apical section of M_{3+4}7
- 6(5). Costa extending to apex of vein R_{4+5} (fig. 63b).....
**Asyndetus** Loew.
 Costa extending to apex of vein M_{1+2} (fig. 63d).....
**Chrysotus** Meigen.
- 7(5). Mesonotum with a large prescutellar depression.....10
 Mesonotum without a large prescutellar depression.
Hydrophorinae8
- 8(7). Crossvein m straight9
 Crossvein m S-shaped (fig. 70a).... **Sigmatineurum** Parent.
- 9(8). Acrostichals present. Genitalia hidden in pregenital
 segments of abdomen (fig. 66g). Third antennal
 segment with a small ventral lobe (fig. 66e).....
**Hydrophorous** Fallén.
 Acrostichals absent. Genitalia well developed, not
 hidden (fig. 67a). Third antennal segment without
 a ventral lobe (fig. 67c) **Paraliancalus** Parent.
- 10(7). Acrostichals biserial. Vein R_{4+5} and M_{1+2} converg-
 ing so that the fifth section of the costa (between
 tips of veins R_{4+5} and M_{1+2}) is about one-fourth
 the length of the fourth costal section (fig. 71a).
 Hypopygium bulbous (fig. 71b). *Medeterinae*.....
**Medetera** Fischer.
 Acrostichals uniserial or absent. Veins R_{4+5} and
 M_{1+2} more or less straight.....11

- 11(10). Second antennal segment with a thumb-like projection into the third on the inner surface. Male with the third antennal segment produced into a slender point at apex (fig. 72a). Third segment rounded in female. Raphiinae.....**Syntormon** Loew.
 Second antennal segment normal, without thumb-like projection.....12
- 12(11). Third costal section (between vein R_{2+3} and R_{4+5}) much shorter than fourth section, about one-half the length of fourth. Arista apical (fig. 68e). Marine species. Hydrophorinae.....**Paraphrosylus** Becker.
 Third costal section equal to or longer than the fourth. Arista dorsal (fig. 2a). Campsicneminae.....13
- 13(12). Crossvein m longer than the apical section of vein M_{3+4} . Acrostichals absent.....**Eurynogaster** Van Duzee.
 Crossvein m shorter than apical portion of M_{3+4} . Acrostichals present**Campsicnemus** Haliday.

Subfamily CAMPSICNEMINAE Becker

Diaphorinae Aldrich, in part, 1905, Smith. Misc. Coll. 46(1444): 288.

Hydrophorinae Kertész, in part, 1909, Cat. Dipt. 6:289.

Campsicneminae Becker, 1921, Abh. Zool.-Bot. Ges. Wien 13:220.

Sympycninae Van Duzee, in part, 1933, Proc. Haw. Ent. Soc. 8:339.

The members of this subfamily are distinguished from Xanthochlorinae by having acrostichal setae present on the mesonotum and differ from other groups by the short triangular third antennal segment, dorsal arista, convex occiput, and by the presence of a distinct prescutellar depression. These are usually small, weakly bristled flies, lacking bristles at the apex of the abdomen.

Three genera occur in Hawaii and make up the great bulk of our dolichopodid fauna. The species are collected predominantly by sweeping the vegetation and ground litter along mountain trails and in wet rain forests; many are water skaters.

Genus CAMPSICNEMUS Haliday

Campsicnemus Haliday, 1851, in Walker's Insecta Brit., Dipt. 1:187.

Emperoptera Grimshaw, 1902, Fauna Hawaiiensis 3:81. **New synonymy.**

Campsicnemus was proposed as a new name for *Camptosceles* Haliday (1832, Zool. Jour. 5 (19):357) *nec* *Camptoscelis* Dejean (1828, Spec. Gen. Coleopt. 3:420). As indicated by Coquillett (1910:510), *Camptosceles* Haliday is a valid

genus. Under the provisions of Article 36 of the International Rules the name is not to be rejected because it differs only in termination. However, the name *Campsicnemus* Haliday has been used consistently in the dolichopodid literature for over a hundred years and in the best interest of taxonomic stability it certainly would be much better to continue to use this name rather than to revert to the almost completely unused name *Camptosceles*. We have requested that the International Commission for Zoological Nomenclature use its plenary powers and validate the generic name *Campsicnemus* Haliday by placing it on the Official List of Generic Names in Zoology with *Dolichopus scambus* Fallén as its genotype. Also that *camptosceles* Haliday be placed on the Official List of Rejected Names (see Hardy, 1956).

We previously had considered *Campsicnemus* as a feminine name since, as discussed by the junior author (Adachi, 1953:117), the Greek word "*Knemos*" is a feminine noun. It has been pointed out to us by Francis Hemming and confirmed by C. W. Sabrosky and A. E. Pritchard that "whatever may be the gender of a noun before it is Latinized its gender on Latinization becomes the gender appropriate to the Latin language. In the present case the termination ("—us") used when this name was Latinized is a masculine termination and the gender of this name is, therefore, undoubtedly masculine."

This group is closely related to *Eurynogaster* Van Duzee and is distinguished by having the m crossvein shorter than the apical section of vein M_{3+4} , the male genitalia small and inconspicuous (fig. 2m) and acrostichal setae present. They are comparatively small flies; the middle tibiae of the males are often highly ornate. Many species are water skaters, living on the surface of small pools which collect in the rain forests.

Type of genus: *Dolichopus scambus* Fallén.

KEY TO SPECIES OF CAMPSICNEMUS, BASED UPON MALES

1. Wings aborted, reduced to narrow, lanceolate appendages (fig. 5a)2
 Wings normal, well developed.....5
- 2(1). Middle basitarsus one-third to one-fourth as long as second tarsal segment and with a spur at apex. Middle tibia swollen, with a clump of dorsal bristles near apical third (fig. 5b).....3
 Middle basitarsus equal to or longer than second segment, no spur at apex. Middle tibia slender, with four or more bristles arranged along dorsal surface4
- 3(2). Spur on middle basitarsus strongly curved at a right angle, at about middle, enlarged and rounded at

- apex; basal half of spur pilose (fig. 2e). Dorsal bristles of middle tibia not short and peg-like, arranged in a row near apical third. (West Maui).....
 **aeptus** n. sp.
- Spur on middle basitarsus curved near base, otherwise straight, rather slender, parallel-sided, and bare. Middle tibia with a dense clump of short, peg-like dorsal bristles at apical third (fig. 5b). (Molokai) **bryophilus** (Adachi).
- 4(2). Wings with a well-developed apical bristle (fig. 24e). Middle tibia with four dorsal bristles. Mesonotum polished black. (Koolau Mountains, Oahu).....
 **mirabilis** (Grimshaw).
- Wings without an apical bristle (fig. 18b). Middle tibia with seven long, posterodorsal bristles (fig. 18a). Mesonotum subopaque, bronze-brown. (East Maui) **haleakalae** (Zimmerman).
- 5(1). Middle femur with an anterior hook at apex. Middle tibia as in figure 39g. Front tibia with three to four long dorsal bristles at about apical third (fig. 39e). (Oahu)..... **williamsi** Van Duzee.
- Not with the above characters.....6
- 6(5). Middle tibia with a projection near base, or at middle (in *insuetus* n. sp.) (figs. 17c, 21b)7
- No such projection present at base or middle of tibia, with not more than a slight, barely perceptible bump; if the tibia possesses a projection, it is present on the apical third or fourth of the segment and the middle basitarsus has a strong black apical spur24
- 7(6). Middle tibia extending beyond the insertion of basitarsus and with about five very long curved bristles at apex (fig. 17b). (Oahu) **gloriosus** Van Duzee.
- Middle tibia not so extended at apex and without such bristles8
- 8(7). Middle tibia slender, not noticeably swollen or sinuate...9
- Middle tibia distinctly swollen and/or sinuate.....13
- 9(8). Arista thickened and flat (fig. 31d). Projection at base of middle tibia very well developed, shaped like the handle of a cane and nearly one-third as long as tibia (fig. 31e). (Kauai)..... **platystylatus** n. sp.

- Not as above.....10
- 10(9). Wings broadest at about a level with the apex of vein M_{3+4} , narrowed apically and very strongly narrowed basally (fig. 22a). Third tarsal segment of front legs flat and thick on basal three-fifths, developed into a slight hook (fig. 22b). (West Maui) **latipenna** n. sp.
Wings and front tarsus normal.....11
- 11(10). Thorax and antennae predominantly yellow. Middle femur constricted at apex. Four pairs of well-developed dorsocentral bristles present. Middle tibia with truncate posteroventral bristles and middle femur with well-developed ventral bristles. Eyes contiguous on face.....12
Thorax and antennae predominantly brown to black. Middle femur not constricted apically and lacking strong ventral bristles. Five pairs of dorsocentral bristles present. Middle tibia lacking truncate posteroventral bristles. Eyes separated on the face by a width equal to two and one-half to three rows of eye facets. (Hawaii) **grimshawi** Van Duzee.
- 12(11). Middle tibia with a row of long hair-like anterior bristles only on apical half of segment (fig. 26c). Middle femur with two strong ventral bristles near middle (fig. 26b). Front tibia lacking a dorsal bristle. (Maui) **nambai** n. sp.
Middle tibia lacking anterior bristles except for about six small bristles near median portion (fig. 14d). One dorsal bristle present near middle of front tibia. (Hawaii)..... **flavithorax** n. sp.
- 13(8). Middle tibia with a rather large knob-like projection at middle of segment. Middle legs as in figure 21b. (Kauai) **insuetus** n. sp.
Projection on middle tibia smaller and situated near base of segment.....14
- 14(13). Middle basitarsus one-fourth to one-half longer than tibia15
Middle basitarsus distinctly shorter than tibia17
- 15(14). Middle basitarsus one-half longer than tibia. Projection at base of middle tibia broad and truncate. Middle legs as in figure 30d. (Maui) **philohydratus** n. sp.

- Middle basitarsus one-fourth longer than tibia. Middle tibia with a slender, pointed projection at base. Middle legs as in figures 8h and 22f.....16
- 16(15). Middle tibia with a pointed projection at apical third and lacking flat scale-like bristles except at base (fig. 8g). Hind femur with five to six long anteroventral bristles. (Molokai).....*contortus* Parent.
Middle tibia without such a projection but with a clump of three scale-like bristles at apical third (fig. 22e). Hind femur with two or three long anteroventral bristles. (Lanai).....*lepidochaetes* n. sp.
- 17(14). Middle femur thickened basally, strongly arched ventrally beyond middle and enlarged and flattened apically on anterior face. Hind femur with a row of evenly spaced anteroventral bristles.....18
Not as above. Hind femur with only one to three short, black, anteroventral bristles placed close together near middle or near base of segment.....19
- 18(17). Enlarged apex of middle femur with a preapical spine-like process on anterior margin. Middle legs as in figure 9e. (Oahu).....*crinitibia* Van Duzee.
No such spine-like process. Middle legs as in figure 36b-c. (Hawaii).....*sinuatus* Van Duzee.
- 19(17). Middle basitarsus with two erect, ventral bristles. Middle legs as in figure 2i, j, and k. (Oahu)
.....*bellulus* Van Duzee.
No ventral bristles on basitarsus.....20
- 20(19) Front tibia with long, fine hairs extending the entire length on ventral surface. Hind femur with one or two stout, black, ventral bristles near middle. Middle legs as in figure 37e-f. (Hawaii).....*terracolus* n. sp.
Front tibia not ciliated. Other characters not as above....21
- 21(20). Middle basitarsus with long, anterodorsal cilia extending the entire length of the segment. Middle femur with ventral bristles only on apical third (fig. 35g). Hind femur with three black, posteroventral bristles near base. (Hawaii).....*silvaticus* n. sp.
No long cilia present on middle basitarsus. Ventral bristles on middle femur extending to about basal third of segment. No ventral bristles present on hind femur.....22

- 22(21). Middle tibia with numerous long, curved bristles on anterodorsal surface at apical third; middle tibia long, slender, strongly curved and about three times longer than basitarsus (fig. 19d). (Hawaii)-----
 -----**hygrophilus** n. sp.
 The long hairs of middle tibia not extending over apical third of segment; tibia not so elongate and about two times longer than basitarsus-----23
- 23(22). Posteroventral bristles of middle femur arranged at middle of segment and extending to apical fourth; middle femur with a small rounded preapical projection on anteroventral surface just opposite the projection at base of tibia (fig. 11c). (Hawaii)-----
 -----**dicondylus** n. sp.
 Posteroventral bristles of middle femur arranged at basal third; no such projection at apex of femur. Middle legs as in figure 2h. (Hawaii)....**amblytylus** n. sp.
- 24(6). Hind femur with one strong anteroventral bristle situated at apical one-third to two-fifths of segment; this bristle is about one-half as long as the femur-----25
 Usually without an anteroventral bristle on hind femur; if the hind femur has a moderately strong anteroventral bristle it is situated at the apical one-fifth of the segment and is about one-fifth as long as the femur-----26
- 25(24). Middle tibia terminating in one long, slender bristle which extends to apex of tarsus. Second segment of middle tarsus developed into a spine-like projection at base (fig. 2f). Last segment of front tarsus white. (Maui)-----**albitarsus** n. sp.
 Middle tibia with two apical bristles which extend just slightly beyond end of basitarsus. Second tarsal segment with just a slight bump near base (fig. 39a). Front tarsus dark colored. (Maui)....**uniseta** n. sp.
- 26(24). Second segment of middle tarsus developed into a pointed projection near base. Middle tibia with one or two very long hairs at apex, these are equal to at least three segments of the tarsus-----27
 Without such structures -----28
- 27(26). Two long, apical, hair-like bristles present on middle tibia, the longest extends to about apex of third

- tarsal segment. First segment of middle tarsus shorter than second and produced into a blunt point at apex (fig. 6d). (Molokai).....**chauliopodus** n. sp.
- One very long apical hair present on middle tibia, extending to apex of tarsus. First tarsal segment longer than second and not produced at apex (fig. 19f). (Hawaii).....**impariseta** n. sp.
- 28(26). Middle basitarsus usually distinctly shorter than second tarsal segment or, if subequal, it terminates in an apical spur.....29
- Middle basitarsus distinctly longer than, or subequal to, second tarsal segment, never with an apical spur....61
- 29(28). Middle basitarsus flat and lobate at apex (figs. 12d, 24d)30
- Middle basitarsus without a flat apical lobe.....31
- 30(29). Middle tibia twisted, enlarged and flattened on apical two-fifths. Apical half of middle femur covered with fine hairs on dorsum (fig. 12e). (Hawaii).....
-**distortipes** Grimshaw.
- Middle tibia enlarged near apex but not twisted (fig. 24d). Apex of middle femur without fine dorsal hairs. (Oahu) **membranilobus** Parent.
- 31(29). Middle basitarsus without an apical spur, basitarsus not developed at apex.....32
- Middle basitarsus with a well-developed, black apical spur (fig. 6a), or the apex is produced beyond the base of the second tarsal segment (fig. 28g).....33
- 32(31). Legs entirely dark colored. Five pairs of dorsocentral bristles present. All femora with either bristles or long pilosity on ventral surfaces. Middle tibia with a row of truncate ventral bristles on basal half and without a ventral projection on apical third (fig. 26d). (Kauai).....**nigricollis** Van Duzee.
- Femora yellow. Three pairs of dorsocentral bristles present. Distinct ventral bristles present only on middle femur. Middle tibia lacking truncate ventral bristles and with a small ventral projection on apical third and with very long anteroventral ciliation near apex (fig. 23c). (Molokai).....**longitibia** n. sp.
- 33(31). Middle basitarsus about equal to or distinctly longer than the second tarsal segment.....34

- Middle basitarsus distinctly shorter than second segment, measured to the point of insertion of the second tarsal segment.....36
- 34(33). Middle tibia strongly flattened dorsally and somewhat twisted. Apical spur of middle basitarsus at least one-half as long as basitarsus.....35
- Middle tibia straight, not flattened. Spur of middle basitarsus short, about one-sixth as long as basitarsus (fig. 20d). One anterodorsal bristle present on middle tibia near apical one-fifth. (Oahu)
..... **inermipes** Malloch.
- 35(34). Front femur with a peculiar round swelling on anteroventral surface, near middle. Middle tibia lacking long ciliation along posterodorsal margin but with a dense clump of black bristles near middle and another small clump at basal third on this surface (fig. 6a). Spur of middle tibia short and stout, about one-half as long as basitarsus. (Maui)
..... **camptoplax** n. sp.
- Front femur without such a swelling. Middle tibia lacking the clumps of black bristles on posterodorsal surface but with long ciliation extending the entire length of the segment on this surface. Spur slender, about as long as basitarsus (fig. 32d). (Maui)..... **profusus** n. sp.
- 36(33). Arista capitate (fig. 28f). Second tarsal segment of middle leg elongate, one-half as long as the tibia and covered with long fine ciliation (fig. 28g). (Oahu)..... **patellifer** Grimshaw.
- Arista normal, not capitate. Second tarsal segment of middle leg not so elongate.....37
- 37(36). Front coxa with a large, black apical bristle or spine.....38
- Front coxa without a large apical bristle or spine, with a series of short bristles around the apex.....39
- 38(37). Front femur thickly bristled below on basal half. Middle basitarsus (fig. 37b) short; excluding the apical spur, it is slightly less than one-fourth as long as the next tarsal segment. (Hawaii)..... **spinicoxa** n. sp.
- Front femur bare below, except for one or two small bristles at apex. Middle basitarsus almost one-half as long as second segment. (Maui)..... **perplexus** n. sp.

- 39(37). Second and third tarsal segments of front legs flattened and broad. Middle femur without distinctive bristles on venter. Middle tibia straight. Middle basitarsus one-fifth as long as the following tarsal segment. (Molokai).....**plautinus** Adachi.
 Second and third segment of front tarsi not flattened.
 Middle legs not as above.....40
- 40(39). Middle femur thick and sharply angulate at base, widest part equal to one-third the length of the segment. Middle trochanter with two blunt, heavy bristles (fig. 4a). (Oahu).....**brevipes** Van Duzee.
 Middle femur not sharply angulate at base. Middle trochanter without large, blunt bristles.....41
- 41(40). Middle tibia greatly thickened, widest at apical one-third or one-fourth; at this point a projection is developed on the anterior surface (fig. 25d).42
 The middle tibia may be greatly thickened but is without a projection on the apical third.....43
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 Smaller species (1.5 mm. in length). Projection of middle tibia covered with numerous short bristles (fig. 34c). Third antennal segment conical, acutely pointed at apex and twice as long as wide. (Molokai).....**ridiculus** Parent.
- 43(41). Front femur with a cluster of long ventral bristles near base. Middle femur without ventral bristles.....44
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- 44(43). Middle tibia with three clusters of long bristles on the dorsal surface, one on the basal one-fifth of the segment, the second on the basal two-fifths and the third on the apical two-fifths; also with a large posterodorsal bristle on the apical one-third of the segment just below the apical cluster of long bristles. Middle basitarsus, excluding the apical spur, about four-fifths as long as the following segment (fig. 29c). (Hawaii and Molokai).....**penicillatus** Parent.

- Middle tibia with just a small cluster of bristles at basal third and with two or three long hair-like bristles situated near the strongly bent posterodorsal bristle; posterodorsal bristle situated below the middle of the segment (fig. 17e). Middle basitarsus about two-thirds as long as second segment. (Hawaii).....**goniochaeta** n. sp.
- 45(43). Mesonotum with three pairs of dorsocentrals and no acrostichal bristles. Middle tibia with two dorsal bristles, one basal and one median; also one anterior bristle present on apical one-sixth. (Oahu).....**nigroanalis** Parent.
Four or five pairs of dorsocentrals and acrostichals present. Middle tibia not as above.....46
- 46(45). Five pairs of long dorsocentral bristles present. Middle tibia straight, with two dorsal bristles and with a row of erect, blunt ventral bristles on basal two-thirds. All femora with ventral ciliation. (Molokai).....**obscurus** Parent.
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- 50(49). Middle legs with second tarsal segment inserted at about middle of first (first segment extended half its length beyond insertion of second). Spur of middle tarsus at right angle to first segment, blunt and slightly enlarged at apex (fig. 6c). Middle tibia not densely villose and front basitarsus not extended at apex. (Maui).....**capitulatus** n. sp.
Middle legs with second tarsal segment inserted near apex of first, spur straight, sharp pointed (fig. 31c). Middle tibia densely covered with long villosity along posterodorsal and at least on basal half of

- anterodorsal surfaces. Front basitarsus extended into a small point, bearing two setae at its apex. (Oahu) ----- **planitibia** Parent.
- 51(49). Middle tibia rather slender and arcuate, at least one-third longer than middle tarsus. Middle basitarsus short and straight, about one-half as long as second segment ----- 52
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- 52(51). Middle tibia strongly arcuate and flattened, about as wide as femur; the entire dorsal surface of tibia thickly covered with recumbent hairs and with a clump of densely placed, stout, peg-like setae and a strong bristle on dorsal surface near apex. Spur of middle basitarsus heavy, flat, and rounded at apex (fig. 29g). (Molokai) -----
----- **petalcnemus**, n. n., for *arcuata* Adachi.
- Middle tibia gently arcuate and not strongly flattened, little over one-half as wide as femur; dorsal surface with short inconspicuous hairs in median portion only on basal one-half and no clump of peg-like setae present. Spur of middle basitarsus fine, sharp-pointed, bristle-like (fig. 25f). (Maui) ----- **mucronatus**, n. sp.
- 53(51). Middle basitarsus extended at apex beyond base of second tarsal segment, no distinct spur present but bearing one or two bristles at apex. A row of strong posterodorsal bristles present extending over entire length of middle tibia (fig. 5c). (Molokai) -----
----- **calcaritarsus** Adachi.
- Middle basitarsus not extended and with a large black spur at apex. No strong bristles present on posterodorsal surface of middle tibia (fig. 33a). (Hawaii) -----
----- **pynochaeta** n. sp.
- 54(48). Middle tibia completely twisted, dorsal margin lined with long setae, longer than tibia and wavy at apices (fig. 9d). Third tarsal segment of front legs equal to second. Middle femur without well-developed posteroventral bristles. (Hawaii) ----- **crassipes** n. sp.
- Middle tibia not completely twisted, long setae not wavy at apices; tibia as in figure 7g. Third tarsal

- segment of front legs one-third longer than second.
Middle femur with well-developed posteroventral
bristles. (Oahu).....**compressus** n. sp.
- 55(47). Middle basitarsus extending apically about its own
length before spur; apical spur straight and elon-
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backwards. Third antennal segment sharply tapered
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spur about one-fourth as long as basitarsus (fig.
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- 60(59). Middle tibia with one large anterodorsal bristle at
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terior bristles (fig. 8a). (Oahu).....**congregatus** Malloch.
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surface (fig. 39d). Middle tibia lacking a dorsal
bristle. (Maui).....**viridulus** n. sp.
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.....**norops** n. sp.
- 64(61). Eyes not contiguous, narrowest portion of face about
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densely covered with short peg-like bristles. Postero-
ventral bristles of middle tibia truncate, about as
long as width of tibia (fig. 2-1). (Oahu)
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.....*tibialis* Van Duzee.
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- 68(66). Legs almost entirely yellow. Middle tibia with rows of long, hooked hairs down the anteroventral and anterior surfaces. Middle basitarsus with a row of long, anterior cilia and with a large hair-like bristle at apex (fig. 8e). (Maui)*coniculus* n. sp.
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- 75(71). Middle tibia sinuously curved. Middle femur strongly thickened, sharply attenuated at apex with a cluster of ventral bristles at apex of thickened portion (fig. 15b). Three pairs of dorsocentral bristles present. (Oahu)**flexuosus** Parent.
Middle tibia not sinuously curved. Middle femur not

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- 76(75). Five pairs of dorsocentral bristles present.....77
- Four pairs of dorsocentral bristles present.....78
- 77(76). Middle tibia straight, not swollen, covered with long ciliation on both dorsal and ventral surfaces (fig. 16c); the longest setae are in the anteroventral series. Acrostichals uniserial. Wings with fumose markings (fig. 16d). (Molokai and Oahu).....
.....**fumipennis** Parent.
- Middle tibia slightly swollen, compressed dorsoventrally with one anterodorsal bristle on basal one-fourth and a row of long anterior bristles on the apical one-half (fig. 7a). Acrostichals irregularly biserial. Wings without fumose markings. (Oahu)
.....**ciliatus** Van Duzee.
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**tarsiciliatus** Parent.
- 84(83). Apical three-fifths of middle tibia with numerous long cilia on anterior and anterodorsal surfaces (fig. 7b). (Molokai).....**clinotibia** n. sp.
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- 85(84). Middle tibia with a strong anterior bristle on apical one-third. Middle basitarsus three-fifths as long as the tibia (fig. 4f). (Maui).....**brunnescens** n. sp.
 Middle tibia with a small anterior bristle near middle. Middle basitarsus one-half as long as tibia (fig. 16a). (Molokai).....**fulvifacies** n. sp.
- 86(70). Anterior margin of middle tibia slightly sinuate, biconvex, with two clusters of bristles on the convex portions; the lower cluster is larger and the bristles are better developed (fig. 3a). (Molokai).....
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- 89(88). Body dark brown. Middle femur with posterior bristles.....

cles on apical fourth. Setae on swelling of middle tibia heavy, not hair-like (fig. 17a). (Hawaii)-----

-----**fusticulus** n. sp.

Body predominantly yellow. Middle femur without posterior bristles on apical fourth. Setae on swelling of middle tibia fine and hair-like (fig. 15c).

(Oahu)-----**fragilis** Parent.

- 90(88). Hind tibia with three anterodorsal bristles before apex. Hind basitarsus one-third as long as tibia. The clump of hairs on basal third of middle tibia made up of fine, yellow-brown, hooked setae, the long hairs concentrated on the posterior and anterodorsal surfaces and short hairs arranged between them -----91

Hind tibia with but two anterodorsal bristles before apex. Hind basitarsus about one-fourth as long as tibia. The clump on the middle tibia extending to about basal two-fifths of segment and made up of short, black, thickened setae evenly distributed over the dorsal surface (fig. 3b). (Molokai)-----

-----**biseta** n. sp.

- 91(90). Hind femur with distinct bristles or erect hairs along anteroventral surface-----92

No bristles or bristle-like hairs on anteroventral surface of hind femur. (Hawaii)-----**paniculatus** n. sp.

- 92(91). Anteroventral surface of hind femur with moderately developed black bristles; some are equal in length to more than one-half to three-fourths the width of the femur. Posteroventral surface of middle femur with eight strong bristles extending from basal sixth to apical third of segment (fig. 35a) and with a continuous row of short anteroventral bristles extending almost to base of segment. (Hawaii)-----**setiger** n. sp.

Anteroventral surface of hind femur with erect, yellow-brown hairs, their length equal to less than half the width of the femur. Posteroventral surface of middle femur with five to six strong bristles extending from about basal sixth to apical fifths (fig. 35b) and with a row of short anteroventral bristles extending to about middle of segment. (Hawaii)-----**modicus** n. sp.

- 93(87). Middle tibia with a median cluster of bristles on the dorsal surface (fig. 24a). (Maui).....**medioflocus** n. sp.
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- 94(93). Middle tibia with a row of closely placed anterior bristles extending from about basal sixth to apical two-fifths of segment (fig. 23f). (Oahu, Maui, and Hawaii) **macula** Parent
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Middle tibia slightly bent at basal third, posteroventral bristles nearly two times longer than width of segment and no strong dorsal bristles present. Middle femur as in figure 14d. (Hawaii).....
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- 102(101). Middle femur with well-developed ventral bristles. Thorax partly yellow, mesonotum with brown vitæ. Bases of halteres and antennae yellow 103
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- 103(102). Eyes separated on the face by a width equal to two rows of eye facets. Abdomen all black. Middle basitarsus less than one-fourth as long as tibia. (Maui) **diamphidius** n. sp.
Eyes nearly contiguous on face, separated by less than the width of one eye facet. Sides of abdominal terga and all of venter yellow. Middle basitarsus about two-fifths as long as tibia. (Molokai and Hawaii) **flaviventer** n. sp.
- 104(100). Anterior margin of middle femur greatly curved, with a dorsal brush of fine hairs on apex. Middle tibia as in figure 14b. (Hawaii) **fimbriatus** Grimshaw.
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- 106(105). Thorax predominantly yellow. Antennae yellow. Middle femur with long, erect, anterior bristles on the median portion. Middle tibia with short, ventral setae and with long dorsal setae on basal three-fifths. (Oahu) **acuticornis** Parent.

- Thorax dark brown to black. Antennae black. Middle femur with a comb-like series of long, fine, reclinate hairs on the anterior surface. Middle tibia with long ventral setae on basal third and with a series of long anterodorsal setae on apical four-fifths (fig. 30a). (Kauai) **pherocteis** n. sp.
- 107(99). Middle tibia with at least one anterodorsal and usually one dorsal bristle present on basal two-fifths 108
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- 108(107). Three pairs of dorsocentral bristles present. If a dorsal bristle is present on middle tibia it is well separated from the anterodorsal and is situated at about the basal two-fifths of the segment; no long hairs present on the anterior surface of tibia 109
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- 109(108). One dorsal bristle present at basal two-fifths of tibia.
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..... **olympicolus** Parent.
- 111(109). Middle femur with about five yellowish hair-like bristles at middle of segment on lower anterior surface. Anterodorsal bristle situated much nearer dorsal bristle than to base of segment. No ventral bristles present on middle tibia. Hind tibia with but one distinct dorsal bristle, in addition to three anterodorsals. (Oahu) **deficiens** Parent.

- Middle femur with two moderately strong black bristles on lower anterior surface at apical two-fifths of segment; anterodorsal bristle closer to base of segment than to the dorsal bristle. Two short ventral bristles on middle tibia (one at middle, one at apical fourth) and four dorsal bristles on hind tibia (three between basal two-fifths and apical one-third). (Molokai).....**indecorus** n. sp.
- 112(107). Middle tibia with a continuous row of strong, black, anterodorsal bristles extending from basal one-fourth to apical one-fourth. Three pairs of dorso-central bristles present. (Maui).....**distinctus** n. sp.
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Middle tibia gently curved, no anterior bristles present; anteroventral surface with one strong black bristle near apex and eight long, pale, hooked cilia between apical fourth and middle of segment (fig. 13c). (Maui).....**exiguus** n. sp.
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Anterodorsal ciliation of middle tibia dense and
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anterior row being three-fourths the length of the
row behind it (fig. 18e). (Kauai, Molokai, and
Hawaii).....**hispidipes** n. sp.

Campsicnemus acuticornis Parent (fig. 2a-b).

Campsicnemus acuticornis Parent, 1939, Proc. Haw. Ent. Soc. 10:225, fig. 1.

Endemic. Oahu (type locality: Lulumahu Stream).

Type in the British Museum (Natural History). Cotypes from Konahuanui Trail are in the Parent collection at the Museum National d'Histoire Naturelle, Paris. The senior author has studied the type and cotypes.

This fits in the group of species whose members lack fine ciliation on middle tarsi and which have the basitarsus simple and slender; also the middle tibia is straight or nearly so and lacks blunt posteroventral bristles but has long fine

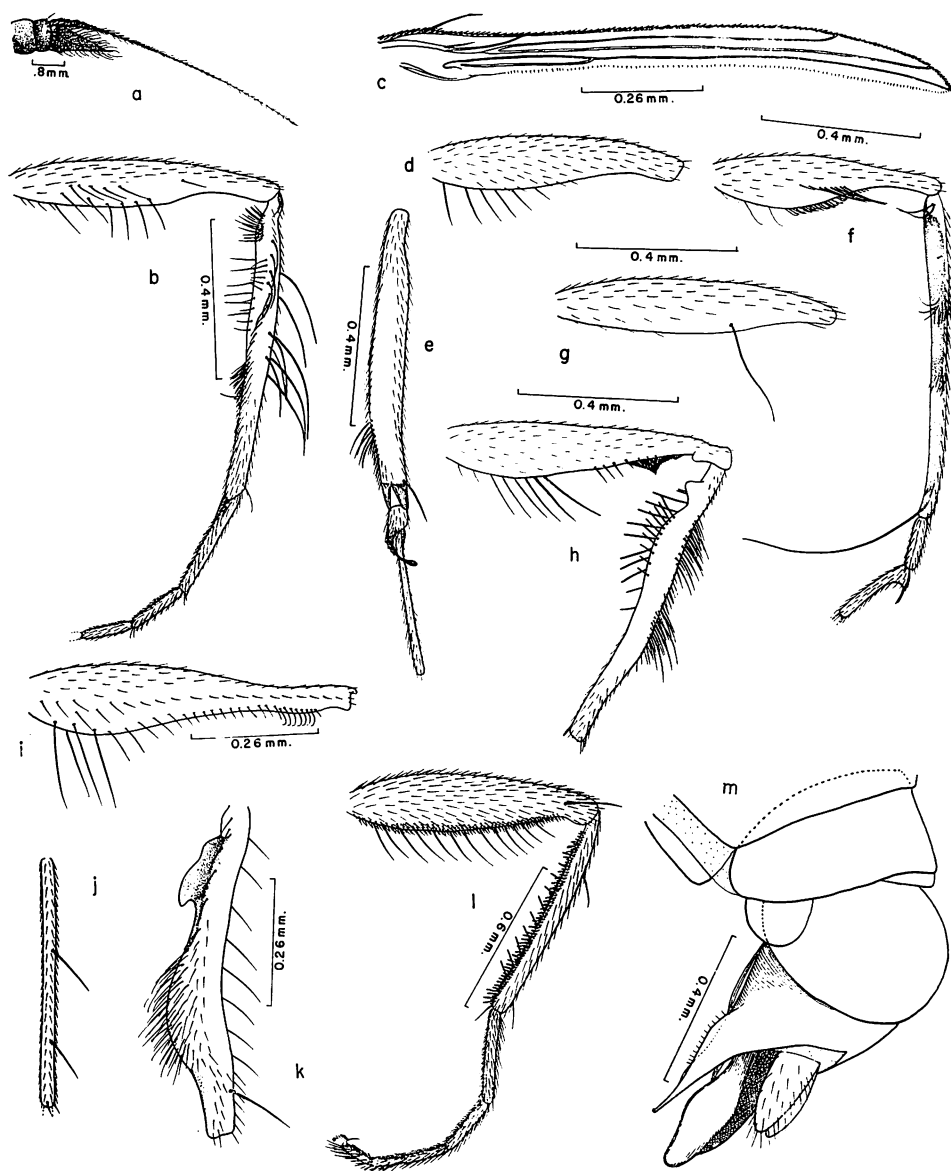


Figure 2—*Campsicnemus acuticornis* Parent: a, antenna; b, middle leg, anterior view. *C. aseptus* n. sp.: c, wing; d, middle femur, anterior view; e, middle tibia and two basal segments of tarsus, dorsal view. *C. albitarsus* n. sp.: f, middle leg, anterior view; g, hind femur, anterior view. *C. amblytylus* n. sp.: h, middle femur and tibia, anterior view. *C. bellulus* Van Duzee: i, middle femur, anterior view; j, middle basitarsus, ventral view; k, middle tibia, anterodorsal view. *C. bicoloripes* Parent: l, middle leg, anterior view; m, male genitalia, lateral view.

ciliation along anteroventral, anterior, and anterodorsal surfaces. It is related to *C. fimbriatus* Grimshaw but the middle femora are not curved and lack the

dorsal brush of fine hairs at apex; also the mesonotum has five pairs of dorso-central bristles.

A small predominantly yellow species. Third antennal segment long pointed, two and a half to three times longer than wide (fig. 2a). Thorax almost entirely yellow, with a brown spot on the metapleura and with a faint indication of a brown vitta down each dorsocentral row in some specimens. The first and fourth pairs of dorsocentral bristles are rather weak. One row of rather well-developed acrostichal setae are present. Legs yellow. Middle femur with a group of rather long bristles in middle on anteroventral and anterior surfaces. Middle tibia slender, slightly curved as seen in direct dorsal view, with a row of long antero-dorsal bristles extending from about basal fourth to apical two-fifths of segment (fig. 2b); also the anterior and anteroventral surfaces covered with long fine ciliation the entire length of the segment. Posteroventral surface with just a few erect hair-like bristles near base of segment. Middle basitarsus slender, about two times longer than second segment.

Length: body, 1.3 mm.; wings, 2.0 mm.

Campsicnemus aeptus Hardy and Kohn, new species (fig. 2c-e).

A species with aborted wings fitting nearest to *bryophilus* (Adachi) than to any other known species. It is best distinguished from *bryophilus* by having the spur at apex of middle basitarsus strongly curved at right angles at about middle, enlarged and rounded at apex, and pilose on the basal half. Also the middle tibia has a row of dorsal bristles near apical third; the clump of short peg-like bristles characteristic of *bryophilus* is lacking.

MALE. Head: Eyes contiguous in the middle of the face. Front brown to black, faintly bronzed. Ocellar and vertical bristles strong, about two-thirds as long as arista. Postvertical bristles rather weak. Antenna dark brown to black with a faint reddish tinge; third segment rather cone-shaped, pubescent around the margin; arista pubescent. Occiput concave; occipital bristles black. **Thorax:** Predominantly dark brown to black dusted with brown pollen, faintly metallic bronze on the mesonotum. The sterna and lower portions of pleura are yellow. Three pairs of dorsocentrals and one pair of strong scutellars are present. Halteres yellow, well developed. **Legs:** Coxae, trochanters, and bases of femora yellow, remainder of legs predominantly brown. Middle femora each with a series of about six rather strong ventral bristles (fig. 2d). Middle tibia thickened on apical half and with a row of close-set anterodorsal bristles on about the apical third and a row of rather short ventral hairs and a strong apical ventral bristle. The middle basitarsus is very short, not counting the spur it is about one-sixth as long as the second segment. The spur is strongly curved at a right angle, is enlarged and rounded at apex, and the basal portion is densely pilose (fig. 2e). The hind coxa has a rather strong posterior bristle at middle. The hind femur is rather swollen, is two times thicker than middle femur and has a moderately well-developed anterior bristle just before the apex. The hind tibia has five

rather small posterodorsal and four anterodorsal bristles. Wings developed as in *bryophilus*, with three radial and two medial veins developed. Vein M_{1+2} ends at the apex of the wing; in *bryophilus* it ends slightly before the apex (figs. 2c and 5a). *Abdomen*: Brown to black, faintly shining, all setae black. Genitalia similar to those of other *Campsicnemus*. Cerci rather thickly pale pilose.

Length: body and wings, 1.5 mm.

FEMALE. Unknown.

Holotype male: Puu Kukui, Maui, 4,000–4,500 ft., June, 1953 (C. R. Joyce). Type in the B. P. Bishop Museum.

***Campsicnemus albitarsus* Hardy and Kohn, new species (fig. 2f–g).**

Fitting near *C. impariseta* n. sp. because of the presence of a very elongate apical bristle on middle tibia and because of the development of the middle femur. It is differentiated by the presence of a strong anteroventral bristle at apical third of hind femur, which is almost half as long as the segment; by the basitarsus of middle legs being shorter than the second tarsal segment; by having the projection at base of second segment of middle tarsus drawn out into a sharp spine; by having only two closely placed anteroventral bristles near base of middle tibia rather than four; and also by having the last segment of tarsus white.

MALE. A rather small predominantly dull black species. *Head*: Eyes narrowly separated on the face, in the median portion the face is almost as wide as one row of eye facets. Lower portion of face dark gray pubescent, remainder brownish yellow. Front and vertex black, very faintly metallic, covered with brown pollen. Basal two segments of antenna yellow, third segment discolored with brown, about one-half longer than wide. *Thorax*: Entirely black, faintly metallic blue to green on mesonotum, rather densely covered with brown pollen above, grayish on the sides. Halteres bright yellow. Three pairs of dorsocentral bristles and no acrostichals present. *Legs*: Predominantly yellow. Tibiae and tarsi tinged with brown. Last segment of front tarsus white. Front legs devoid of conspicuous bristles or hairs. Front basitarsus approximately three-fifths as long as tibia. Middle femur moderately swollen, distinctly attenuated on apical third, anteroventral surface with a row of about 8 moderately strong, closely placed, black bristles at middle of segment; posteroventral surface with a row of about 16, yellow-brown to yellow, hooked setae extending from near base to about apical fourth of segment. Middle tibia slender, flattened dorsoventrally, about one-third longer than tarsus; with a pair of closely placed black bristles near base on anteroventral surface, also with a group of about a half dozen black bristles on anteroventral surface at basal third of segment and another group of about 4 short black bristles at apical third. Posteroventral surface of middle tibia with a row of rather short erect setae extending from about basal fourth to apex; apex of tibia with one very long bristle, this extends to tip of tarsus. Middle basitarsus straight, about two-thirds as long as second segment. Second segment with a

spine-like projection near base (fig. 2f). Hind femur with a strong anteroventral bristle at apical third; this is approximately one-half as long as the femur (fig. 2g). Hind tibia with rather well-developed anteroventral and posteroventral bristles on basal half of segment. *Wings*: Dusky gray fumose. Fourth costal section two-thirds longer than fifth. Veins R_{4+5} and M_{1+2} parallel. Last section of M_{3+4} three to four times longer than m crossvein. *Abdomen*: Subopaque black, faintly shining in ground color, rather thickly covered with brown pollen.

Length: body, 1.1 mm.; wings, 1.5 mm.

FEMALE. Unknown.

Holotype male: Kula Pipeline, above Waikamoi, Maui, 4,200 ft., July, 1956 (D.E. Hardy). Two paratypes: same data as type (D. E. Hardy and R. Namba).

Type in B. P. Bishop Museum, paratypes in U.S. National Museum and University of Hawaii.

***Campsicnemus amblytylus* Hardy and Kohn, new species (fig. 2h).**

Fitting in the group of species which has the middle tibia curved and contorted and possessing a sub-basal knob. It is very close to *C. dicondylus* n. sp. but differs by having the posteroventral bristles of middle femur arranged near the basal third of the segment and by lacking a projection at the apex of the middle femur.

MALE. A small chiefly yellow species. *Head*: Basal two segments of antenna yellow. Third segment yellow-brown, pointed at apex and about one-half longer than wide. Eyes contiguous on the face or nearly so for a distance of about four rows of eye facets. Lower portion of face gray pubescent. *Thorax*: Yellow except for a dark brown to black spot on metapleura, extending on to sides of metanotum, and a rather broad vitta extending down each dorsocentral row. Four pairs of dorsocentral bristles are present, the third pair (from the anterior margin) is small and slightly displaced medianly, not directly in line with the other bristles. One row of acrostichal setae present. Halteres entirely yellow. *Legs*: Yellow with brown discoloration on the outside of the middle coxa and on all of the tarsi. Front femur devoid of ventral bristles except for one posterodorsal just before the apex. Hind femur with small inconspicuous bristles along the ventral surface. Middle femur moderately swollen, with a row of about six rather strong posteroventral bristles at basal third and about six stout, rather short, closely placed posteroventrals near apical one-fourth; anteroventral surface with about six well-spaced, small bristles at apical third. Middle tibia moderately curved and twisted, only slightly swollen on basal third, comparatively slender; anteroventral surface densely covered with bristles and hairs, these arranged in two rather definite patches, one at basal third and one at apical third of segment; anterodorsal surface with two rows of rather flat, blunt bristles extending over the basal half (fig. 2h). Middle basitarsus rather long and slender, equal in length to the next two tarsal segments and about half as long as tibia. *Wings*: Hyaline or nearly so. Fourth costal section one-third to one-half longer than fifth.

Last section of M_{3+4} two and one-half times longer than m crossvein. *Abdomen*: Yellow-brown, dark brown on apices of terga and on genitalia. The genitalia have not been relaxed for study.

Length: body, 1.3 mm.; wings, 2.0 mm.

FEMALE: Unknown.

Holotype male: Kahuku Ranch, 3,600 ft., Hawaii, July, 1953 (D. E. Hardy).

Type in the B. P. Bishop Museum.

***Campsicnemus bellulus* Van Duzee (fig. 2i-k).**

Campsicnemus bellulus Van Duzee, Proc. Haw. Ent. Soc. 8:333, figs. 90, 91.

Endemic. Oahu (type locality: Tantalus "on a wet spot").

Type in the Hawaiian Sugar Planters' Association collection. We have studied the type and have a series of specimens from Tantalus, Poamoho Trail, and head of Kaluanui Valley. It is known only from the Koolau Mountains.

A tiny species with the thorax and legs predominantly yellow. Fitting in the complex which has a basal projection and an apical swelling on middle tibia and the middle basitarsus shorter than the tibia. It is differentiated from other known species by having two erect ventral bristles on each middle basitarsus as well as by other characters of the middle legs as shown in figure 2i-k.

The third antennal segment is attenuated to a long slender point and is almost three times longer than its width. The thorax is entirely yellow except for a faint brown vitta down each dorsocentral row. The face is strongly narrowed above, the eyes almost touching in the median portion of the face; the lower portion of the face is densely silvery pubescent. Front femora devoid of ventral bristles. Hind with 2 or 3 anteroventrals near apex. Each middle femur with 10 or 12 irregularly scattered, black ventral bristles over the swollen portion and with a row of eight short, anteroventral and 6 to 8 anterodorsal bristles situated just before apex of segment. The swollen portion of the tibia is densely setulose over the anterior and anteroventral surfaces. Other details are as in figure 2k.

Length: body, 1.5 mm.; wings, 1.8 mm.

***Campsicnemus bicoloripes* Parent (fig. 2l-m).**

Campsicnemus bicoloripes Parent, 1938, Konowia 16:73, figs. 6, 7.

Endemic. Oahu (type locality: Mt. Olympus, 2,000 ft.). Known only from the Koolau Mountains. Williams (1939:292) says this species "is found rather widely distributed at 2,000 ft. elevation, or less along the Koolau Range. It is a dark vigorous species that skates swiftly in areas often in the shelter of boulders and where also there may be a perceptible current. Such a habitat is the Kaluanui Stream. It was found also on small pools that constituted the very headwaters of a little stream flowing into Manoa Valley." On one of the specimens which

Williams had collected he had written a note "excellent water skater, second on Oahu, to *C. miritibialis*."

Type in the British Museum (Natural History). Topotypic specimens are in Parent's collection, Museum National d'Histoire Naturelle, Paris, and also in the Hawaiian Sugar Planters' Association collection.

Fitting in the group with a simple, slender middle basitarsus. Fitting closest to *C. tibialis* Van Duzee, but the two are not related. It is readily differentiated by the characters given in the key. It differs from all known species of *Campsicnemus* by the large conspicuous male genitalia (fig. 2m).

The face is rather broad. At its narrowest point it is as wide as 5 or 6 rows of eye facets. The lower portion is silvery gray and the remainder is yellow-gray pubescent. Antennae dark brown, third segment rounded at apex and as wide as long. Thorax and abdomen dark brown. Middle femur moderately thickened with a row of long posteroventral bristles and the entire ventral surface densely covered with numerous short bristles. Middle tibia with a posteroventral row of about 15 blunt bristles and entire ventral surface covered with short blunt setae (fig. 2l). Ventral surface of all tarsi covered with dense fine gray pile. Wings light brown fumose.

Length: body, 2.50–2.75 mm.; wings, 3.50–3.75 mm.

The female has not previously been recorded. It is similar to the male in most respects. The bristles of the middle femur are almost identical to those of the male except that the posteroventral row is not quite as long. The hind tibia lacks the blunt posteroventral bristles.

***Campsicnemus bicrenatus* Hardy and Kohn, new species (fig. 3a).**

Fitting in the group of species which lacks ciliation on middle tarsi and which has the middle basitarsus slender, longer than the second tarsal segment. It differs from other species in this complex by having the anterior margin of middle tibia slightly sinuate, biconvex, with two clusters of bristles on the convex portions (fig. 3a).

MALE. A small dark-bodied species. *Head*: Eyes contiguous or nearly so for a distance of about 3 or 4 eye facets. Face gray pubescent. Front, vertex, and occiput very densely brownish gray pollinose. Basal segments of antennae yellow; third segment brown around the margin, subacutely pointed at apex, about one-half longer than wide. *Thorax*: Entirely black except for a tinge of yellow at the sides of the scutellum. Mesonotum densely gray-brown pollinose. Four pairs of dorsocentral bristles present, the third pair rather weak. No acrostichals. Halteres yellow, tinged slightly with brown. *Legs*: Almost entirely yellow. Front femur devoid of ventral bristles. Hind femur without distinct ventral bristles but with a row of short erect bristle-like hairs along anteroventral surface. Middle femur rather slender with a row of 6 to 8 moderately strong posteroventral bristles arranged from near basal fourth to about apical third of segment; also with a row of short bristle-like hairs along anteroventral surface. Middle tibia

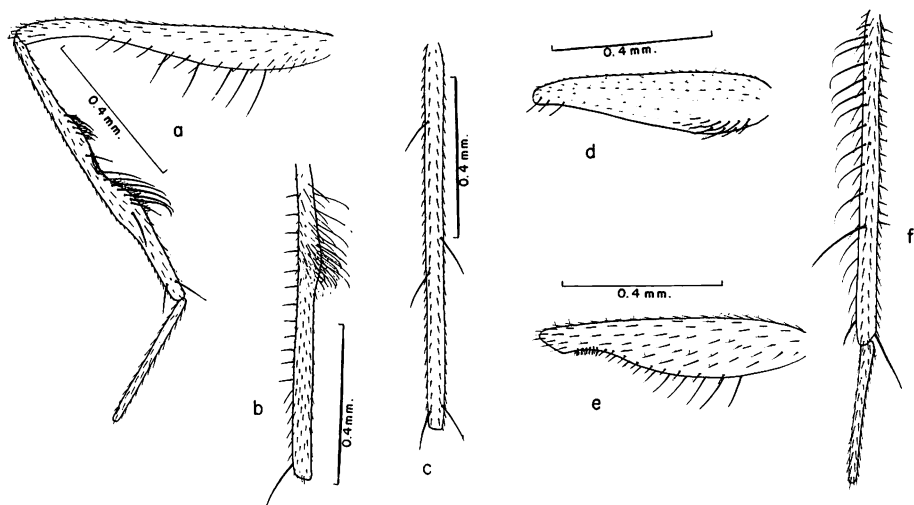


Figure 3—*Campsicnemus bicrenatus* n. sp.: a, middle femur, tibia, and basitarsus, anterior view. *C. biseta* n. sp.: b, middle tibia, dorsal view; c, hind tibia, dorsal view; d, front femur, posterior view. *C. breviciliatus* Parent: e, middle femur, anterior view; f, middle leg, dorsal view.

with a row of erect posteroventral bristles extending over basal two-thirds of segment, with a clump of bristles at basal third on anterodorsal surface and with another clump of stronger, curved anterior bristles just beyond middle of segment, plus a strong anterior bristle near apical third (fig. 3a). Middle basitarsus slender, about two-thirds longer than second segment and slightly over half as long as tibia. Three anterodorsal bristles on hind tibia, one near basal third, one at apical two-fifths, and one just before the apex. *Wings*: Hyaline or nearly so. Fifth costal section slightly broader than fourth. Last section of M_{3+4} two and one-half times longer than m crossvein. *Abdomen*: Black, about equal in length to thorax. The genitalia have not been relaxed for study.

Length: body, 1.65 mm.; wings, 2.25 mm.

FEMALE. Unknown.

Holotype male: Puu Alii, Molokai, 4,200 ft., July, 1953 (M. Tamashiro). Eight male paratypes: one same as type (D. E. Hardy), three from Puu O Kaeha, Molokai, 3,700 ft., July, 1953 (D. E. Hardy), and four from Waikolu Valley, Molokai, 1,400 meters, April, 1955 (C. R. Joyce).

Type in the B. P. Bishop Museum. Paratypes in the following collections: U.S. National Museum, British Museum (Natural History), Hawaiian Sugar Planters' Association, and the University of Hawaii.

***Campsicnemus biseta* Hardy and Kohn, new species (fig. 3b-d).**

Fitting in the group of species which has the middle tarsus not ciliated and

middle basitarsus simple and slender and the middle tibia with a dense clump of sub-basal hairs. It differs from other known species in this complex by having only two anterodorsal bristles on hind tibia before apex; by the hind basitarsus being only about one-fourth as long as tibia and the sub-basal clump on middle tibia made up of short, rather stout, black setae that are scarcely equal in length to the width of the segment, and that extend distally to about the basal two-fifths of the tibia (fig. 3b); also the front femur has two short rows of postero-ventral setae near base of segment (fig. 3d).

MALE. A rather small, dark-bodied species. *Head*: Eyes contiguous on the front for a distance about equal to four or five rows of eye facets. Antenna yellow, tinged with brown around margin of third segment, third segment rounded at apex, about as wide as long. *Thorax*: Dark brown to black, gray-brown pollinose on the dorsum. Four pairs of dorsocentral bristles, the third pair tiny and no acrostichals present. Halteres yellow. *Legs*: Predominantly yellow, middle coxa and apical segments of tarsi tinged with brown. Middle femur moderately slender, with a row of posteroventral bristles extending from near base to about apical one-fifth. Middle tibia slender, the dense clump at basal two-fifths is made up of rather short, uniformly distributed, setae (fig. 3b). A row of rather short (slightly less than the width of the segment) erect setae extends the entire length on anteroventral surface. Middle basitarsus slender, about two-thirds longer than second segment and about one-half as long as the tibia. Hind femur with a row of small anteroventral bristles extending from about basal third to apical third of segment. Anterodorsal surface of hind tibia with one bristle at basal one-sixth of segment, one just beyond middle and one preapical (fig. 3c). *Wings*: Light fumose. Fourth costal section scarcely wider than fifth. Veins R_{4+5} and M_{1+2} slightly diverging. Last section of M_{3+4} three times longer than m crossvein. Abdomen dark brown to black. The genitalia have not been relaxed for study.

Length: body, 1.5 mm.; wings, 2.0 mm.

FEMALE. Like the male except that the legs are not ornate; the face is narrow, at its narrowest point it is about one-half the width of one eye facet.

Holotype male: Hanalilolilo, Molokai, 4,000 ft., August, 1953 (D. E. Hardy). Allotype female: Puu Alii, Molokai, 4,200 ft., July, 1953 (D. E. Hardy). Six paratypes: four males, two females; two same data as type, one same data as allotype, and two from Puu O Kaeha, Molokai, 3,700 ft., July, 1953 (M. Tama-shiro).

Type and allotype in the B. P. Bishop Museum. Paratypes in the following collections: U. S. National Museum, Hawaiian Sugar Planters' Association, and the University of Hawaii.

***Campsicnemus breviciliatus* Parent (fig. 3e-f).**

Campsicnemus breviciliatus Parent, 1939, Proc. Haw. Ent. Soc. 10:225, fig. 2.

Endemic. Oahu (type locality: Punaluu).

Type in the British Museum (Natural History). The senior author has studied the type.

Fitting in the group of species which lacks ciliation on middle tarsi, which has the middle basitarsus simple and slender; which has no dorsal bristle on front tibia or on basal half of middle tibia; and which has long, fine ciliation extending down the anterodorsal surface. It differs from other species in this complex by having a well-developed dorsal bristle on apical third of middle tibia.

A male specimen on hand from Kahana Ridge, Oahu, March 14, 1937 (F. X. Williams), appears to belong here although it differs slightly from Parent's figure of the middle leg. It is a small predominantly brown species. The thorax is yellow-brown, slightly darker in the median portion of the mesonotum. Four pairs of dorsocentrals and no acrostichals are present. The third antennal segment is triangular, rather sharp pointed, about one-half longer than wide. Middle femur rather slender, two or more rows of ventral bristles extend from about basal two-fifths to apex of segment. The stronger bristles are near the middle of the segment and as they progress distally, they become smaller and more numerous (fig. 3e). Middle tibia straight, rather slender, posteroventral surface with a row of short erect setae extending the entire length of the segment; anterodorsal and anterior surfaces with moderately developed bristle-like hairs extending the entire length of the segment. These are longer and stronger near the middle of the segment on the anterodorsal margin. Anterodorsal bristles strong, situated at the apical third of the segment (fig. 3f). Middle basitarsus about one-half as long as the tibia. Anterodorsal surface of hind tibia with one bristle near basal one-fourth, one at apical two-fifths, and one preapical. Dorsal surface of hind tibia with one bristle near middle and one preapical. Parent's figure of the middle legs shows just three long anterodorsal hairs at basal third of segment. This was drawn in posterior view and it is possible that the rows of cilia were not visible from this aspect.

***Campsicnemus brevipes* Van Duzee (fig. 4a-b).**

Campsicnemus brevipes Van Duzee, 1933, Proc. Haw. Ent. Soc. 8:314, figs. 12-14.

Endemic. Oahu (type locality: Waialae iki). Known only from the Koolau Mountains.

Type in the Hawaiian Sugar Planters' Association collection.

Fitting in the group of species which has a short middle basitarsus armed with a black apical spur. Distinguished from other species in this complex by having two large, blunt bristles on middle trochanter and by the middle femur being thick and sharply angulate at base (fig. 4a).

A rather small, dark-bodied species, metallic blue-green on the dorsum (in direct light), faintly greenish on the sides. Third antennal segment long, slender-pointed, three times longer than its greatest width (fig. 4b). Each middle femur swollen and developed into a subacute point below, near basal one-fourth; with

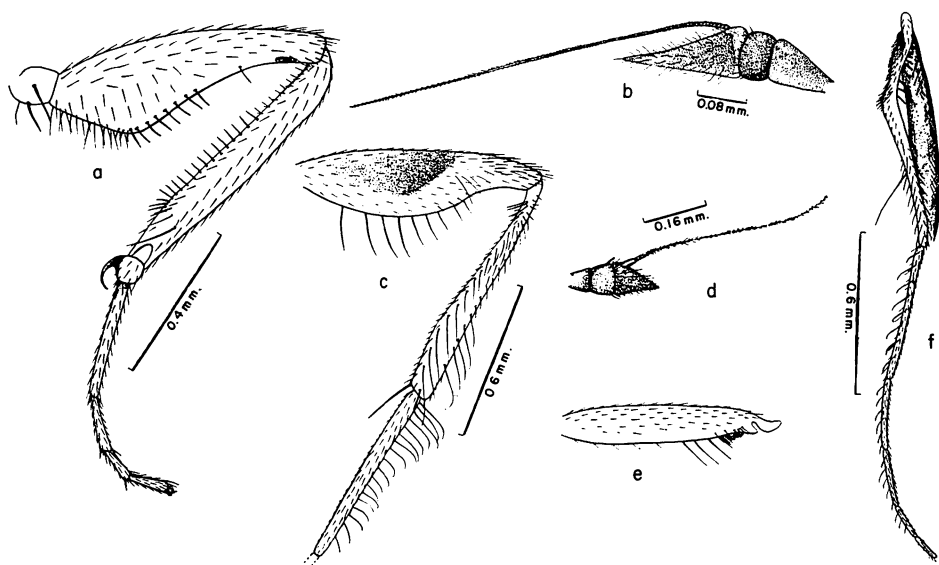


Figure 4—*Campsicnemus brevipes* Van Duzee: a, middle leg, anterior view; b, antenna. *C. brevitibia* n. sp.: c, middle femur, tibia, and basitarsus, anterior view. *C. brunnescens* n. sp.: d, antenna; e, middle femur, anterior view; f, middle leg, dorsal view.

a row of strong thick anteroventral bristles and a row of thinner, not so well-developed, posteroventrals extending from the pointed portion to about the apical third of the segment (fig. 4a). Each middle tibia broad, rather strongly flattened ventrally, with a row of thick, black anteroventral bristles extending from apical fourth to basal third, and with numerous thin, hair-like bristles extending the entire length on ventral and posteroventral surfaces. We saw no evidence of the short spur-like development which Van Duzee (1933, fig. 14) depicted as being present on the preapical ventral surface. The middle basitarsus is about one-fifth as long as the second segment, the spur is curved.

Length: body, 1.5 mm.; wings, 2.0 mm.

***Campsicnemus brevitibia* Hardy and Kohn, new species (fig. 4c).**

Related to *Campsicnemus diffusus* n. sp. because of the ciliated middle tarsi, straight middle tibia, and curved middle femur with long anterior bristles near apical third. It is differentiated by the well-developed antero- and posterodorsal rows of hooked setae on apical three-fourths of middle tibia (fig. 4c).

MALE. Rather small, dark-bodied species. **Head:** Eyes contiguous or nearly so for a distance of about four or five rows of eye facets. Lower portion of the face yellow-gray. First two antennal segments yellow, third brown, subobtusate just slightly longer than wide. **Thorax:** Mesonotum and scutellum brownish gray dusted, very faintly shining in direct light. Four pairs of dorsocentral

bristles and no acrostichals present. *Legs*: Almost entirely yellow. Front femur slender, devoid of ventral bristles. Front tibia short, about two-thirds as long as femur. Front basitarsus slightly curved, rather slender, about four-fifths as long as tibia and over two times longer than second segment. Middle femur moderately swollen, concave on anterior surface and with a clump of four to six rather long brownish yellow hairs at apical third; posteroventral surface with about ten bristles arranged from near basal fourth to about apical third, also with a few short bristles along anteroventral surface. Middle tibia short and thick, scarcely longer than the basitarsus, slightly flattened on the dorsal surface, with long ciliation extending down anterodorsal and posterodorsal surfaces (fig. 4c). Middle tarsi with long ciliation on anterior surface of first four segments; basitarsus long and slender, two and one-half times longer than second segment and almost as long as tibia. Hind femur without ventral bristles except at extreme apex. Only two anterodorsal bristles on hind tibia, one at about basal fourth and one at apex. *Wings*: Faintly fumose. Fourth costal section about equal in length to the fifth. Last section of M_{3+4} two to two and one-half times longer than m crossvein. *Abdomen*: Entirely black. The genitalia have not been relaxed for study.

Length: body, 1.85 mm.; wings, 2.25 mm.

FEMALE. Fitting the description of the male except that the legs are not ornate, the middle femur does, however, have numerous erect setae extending down anteroventral row. The eyes of the specimen at hand are almost contiguous for a length of about two or three eye facets. The head is shrunk and this may be due to distortion.

Holotype male: Kaiholena, Kohala mountains, Hawaii, 4,000 ft., August, 1952 (D. E. Hardy). Allotype female: upper Hamakua Ditch Trail, Kohala mountains, Hawaii, September 3, 1919, "on *Broussaisia*" (O. H. Swezey). Two male paratypes: one, same as type; and one, same as allotype.

Holotype male in B. P. Bishop Museum. Allotype female in Hawaiian Sugar Planters' Association collection; the two paratypes in the U. S. National Museum and the University of Hawaii.

***Campsicnemus brunnescens* Hardy and Kohn, new species (fig. 4d-f).**

Fitting in the group of species which has the middle basitarsus slender and simple, with erect cilia extending over the basal four segments of middle tarsus; middle tibia curved near base and with a row of blunt posteroventral bristles and the middle femur with ventral bristles only on the apical half. It is related to *C. fulvifacies* n. sp. but differs by having a strong anterior bristle at apical third of middle tibia and the basitarsus three-fifths as long as tibia; also by the brown tibiae.

MALE. *Head*: Eyes very narrowly separated on the middle of the face. The narrowed portion of the face is about four or five facets long; the lower portion of the face is gray pubescent. Front and vertex dusted with brown; the upper

portion metallic blue-black in direct light. Antennae yellow-brown; third segment but little longer than wide (fig. 4d). *Thorax*: Mesonotum and scutellum blue-black in ground color, rather densely brown pollinose; the dorsal portion metallic in direct light. Pleura brown above, yellow on lower portion. Four pairs of dorsocentrals present and several small acrostichal setae present. *Legs*: Front coxae and all femora yellow, otherwise brown. Front and hind femora without distinct ventral bristles. Front basitarsus slender and straight, about four-fifths longer than second tarsal segment. Middle femur moderately swollen, rather strongly attenuated at apex and with a slight lobate process on anteroventral margin just before the attenuated portion; ventral bristles confined to the apical half of the segment (fig. 4e). Middle tibia rather slender, strongly bent at basal third; apical half with short fine ciliation on anterodorsal and dorsal surfaces; with a row of blunt posteroventral bristles at basal third; a dense clump of short anterodorsal setae near basal third and with a very strong anterior bristle near apical third; this extends almost to the apex of the segment (fig. 4f). First three basal segments of middle legs ciliated on anterior surface. Basitarsus long and slender, over two times longer than second tarsal segment and two-thirds as long as tibia. *Wings*: Faintly brown fumose, fourth costal section about equal in length to fifth. Last section of M_{3+4} about two and a third times longer than m crossvein. *Abdomen*: Entirely black. The genitalia have not been dissected for study.

Length: body, 1.7 mm.; wings, 2.5 mm.

FEMALE. Unknown.

Holotype male: Waikamoi, Maui, 4,000 ft., July, 1956 (R. Namba). Two male paratypes: Haleakala Crater, Maui, June, 1952 (D. E. Hardy), and Kula Pipeline, above Waikamoi, July, 1956, 4,200 ft. (D. E. Hardy).

Type in the B. P. Bishop Museum. Paratypes in the U.S. National Museum and the University of Hawaii.

***Campsicnemus bryophilus* (Adachi), new combination** (fig. 5a-b).

Emperoptera bryophila Adachi, 1954, Proc. Haw. Ent. Soc. 15:294.

Endemic. Molokai (type locality: Puu O Kaeha, 3,700 ft. elevation). The species lives on the wet, heavily shaded forest floor under dense vegetation and the flies are found hopping about on the moss and lichen-covered ground litter.

Type in the U.S. National Museum.

This fits in the group of species which has aborted wings and it appears to be somewhat related to *Campsicnemus aepus* n. sp. from West Maui because of the structure of the middle legs. It is distinguished by the strongly curved spur at apex of middle basitarsus; this is curved at a right angle at about the middle. The spur at apex of middle basitarsus is straight-sided, rather slender, curved only near its base, not enlarged apically, and the middle tibia has a dense clump of short peglike dorsal bristles at apical third (fig. 5b).

The original description is adequate for this species; the structural details are as is shown in figures 5a and 5b.

Length: body and wings, 1.5–2.0 mm.

Campsicnemus calcaratus Grimshaw.

Campsicnemus calcaratus Grimshaw, 1901, Fauna Hawaiiensis 3:14, pl. 1, fig. 25.

Endemic. Molokai (type locality: "Molokai Mts., 4,000–4,500 ft.").

Type in the British Museum (Natural History).

Fitting in the group of species which has the middle basitarsus short and armed with a spur at apex; also the middle tibia more or less straight, only slightly thickened. It is differentiated from related species by the short ventral bristles on middle femur (see Grimshaw: 1901, pl. 1, fig. 25).

Known only from the type male and the original description. Grimshaw shows the ventral bristles on middle femur as being rather short, their length about half the width of the segment. His figure shows abundant, moderately long hairs on the entire dorsal surface of the hind tibia and short hairs and bristles on the ventral surface. He says the middle basitarsus is a little shorter and thicker than the second segment. This species is obviously very close to *C. putillus* Parent, and evidently is separated by the shorter ventral bristles on the middle femur.

Campsicnemus calcaritarsus Adachi (fig. 5c–e).

Campsicnemus calcaritarsus Adachi, 1953, Proc. Haw. Ent. Soc. 15:120, fig. 3a–f.

Endemic. Molokai (type locality: Manawainui Valley). Known only from the mountains of Molokai. Collected on the ground litter in very wet habitats on the trails and under the tree ferns.

Type in the U. S. National Museum.

Fitting in the group of species which has the basitarsus of the middle legs shorter than the second segment and the middle tibia flattened on the dorsal surface. It seems related to *C. pychnochaeta* n. sp. from Hawaii, but is differentiated by lacking a spur at the apex of the middle basitarsus (fig. 5c) and by having a row of strong posterodorsal bristles present over the entire length of the middle tibia (fig. 5d).

Antennae yellow, tinged with brown on the third segment. Third segment about one-half longer than wide and rounded at apex (fig. 5e). The mesonotum is yellow, tinged with brown, usually with three indistinct vittae down the median portion, sometimes with the entire mesonotum discolored with brown. The pleura are entirely yellow except for a dark brown to black spot over the metapleura extending onto the sides of the metanotum. Legs yellow except for the brown tarsi and for a brown discoloration on the outside surface of each middle

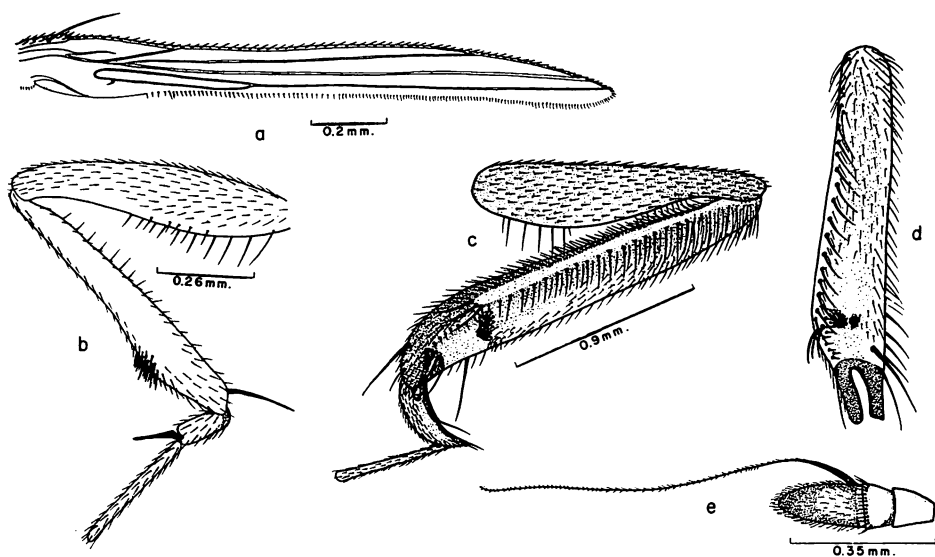


Figure 5—*Campsicnemus bryophilus* (Adachi): a, wing; b, middle femur, tibia, and basal two tarsal segments, anterior view. *C. calcaritarsus* Adachi: c, middle leg, anterior view; d, middle tibia, dorsal view; e, antenna.

coxa. Each middle tibia is flattened dorsally with a row of rather strong postero-dorsals extending the entire length of the segment and with rather strong anterodorsal bristles developed on apical third; also with two dense clumps of short bristles near apical fifth of segment (fig. 5d). Middle basitarsus as in figure 5c. Extended beyond the base of the second segment, rounded and with two bristles at the apex. For more complete details refer to figure 5c-e and to the original description.

Length: body, 3.0 mm.; wings, 3.7 mm.

***Campsicnemus camptoplax* Hardy and Kohn, new species (fig. 6a).**

Fitting in the group of species which has a strong spur at apex of middle basitarsus and the middle basitarsus longer than second tarsal segment; also the middle tibia strongly flattened dorsally. It runs near *C. profusus* n. sp. and differs by the front femur having a peculiar round swelling near middle of antero-ventral margin; by the posterodorsal surface of middle tibia possessing a dense clump of black bristles near middle and another clump of several black bristles near basal third; by lacking the long ciliation along posterodorsal margin of middle tibia; and by the spur of the middle basitarsus being short and stout, only about one-half as long as basitarsus (fig. 6a).

MALE. Head: Eyes joined on face for a distance equal to about three to four eye facets. Lower portion of face subshining brown to black, almost devoid of

pubescence. Front and vertex black covered with brownish gray pollen. First two antennal segments yellow, third segment yellow-brown, rounded at apex, about as wide as long. *Thorax*: Predominantly brown, lower half of pleura yellow, mesonotum and scutellum covered with brown pollen, shining in the median portion in direct light. Four pairs of strong dorsocentrals and one row of acrostichals present. Halteres yellow. *Legs*: Predominantly yellow. Front femur thickened, devoid of ventral bristles and with a knob-like swelling on inner anteroventral surface. Front tibia slightly arcuate on anterior margin. Front basitarsus slender, about three-fourths as long as tibia. Middle femur moderately swollen, somewhat attenuated apically and with eight or nine posteroventral bristles extending from about basal fourth to about apical third. Middle tibia strongly flattened dorsally and contorted, the flattened dorsal surface containing four clumps of closely placed black bristles, one just behind apex near anterodorsal surface, another rather large clump near middle on posterodorsal surface, and a small clump near middle on anterodorsal surface, besides a small clump on posterodorsal surface near basal third; also with a very strong preapical posterodorsal bristle. Anteroventral surface with a row of short, erect bristles extending from about basal third to apical third of segment. Middle basitarsus about one-third longer than second tarsal segment. The spur as in figure 6a. Hind femur with a row of about six small anteroventral bristles just before the apex, also with several posteroventral setae preapically. Hind tibia with a row of rather well-developed ventral setae extending over basal half, the length of these is about equal to the width of the segment; anterodorsal surface with four bristles arranged between basal third and apical third of segment. Also with three dorsal bristles before the apex, one at basal fifth, one at basal two-fifths, and one near apical third. *Wings*: Lightly fumose. Fourth costal section about one-third to one-half longer than fifth. Last section of M_{3+4} about three and one-half times longer than m crossvein. *Abdomen*: Black, covered with gray-brown pollen, slightly shining in direct light.

Length: body, 2.40–2.50 mm.; wings, 3.00–3.15 mm.

FEMALE. Unknown.

Holotype male and one paratype male: Kula Pipeline, above Waikamoi, Maui, 4,000–4,200 ft., July, 1956 (D. E. Hardy).

Type in B. P. Bishop Museum. Paratype in U.S. National Museum.

***Campsicnemus capitulatus* Hardy and Kohn, new species (fig. 6b–c).**

Fitting in the group of species which has the middle basitarsus short and bearing a strong apical spur; the middle tibia strongly flattened dorsoventrally, and the third segment of front tarsus elongated. It is related to *C. planitibia* Parent, but the middle basitarsus is extended well beyond the point of insertion of the second tarsal segment; the spur is blunt and capitate and is at almost a right angle to the first tarsal segment; the middle tibia is not densely villose and the front basitarsus is not extended at apex.

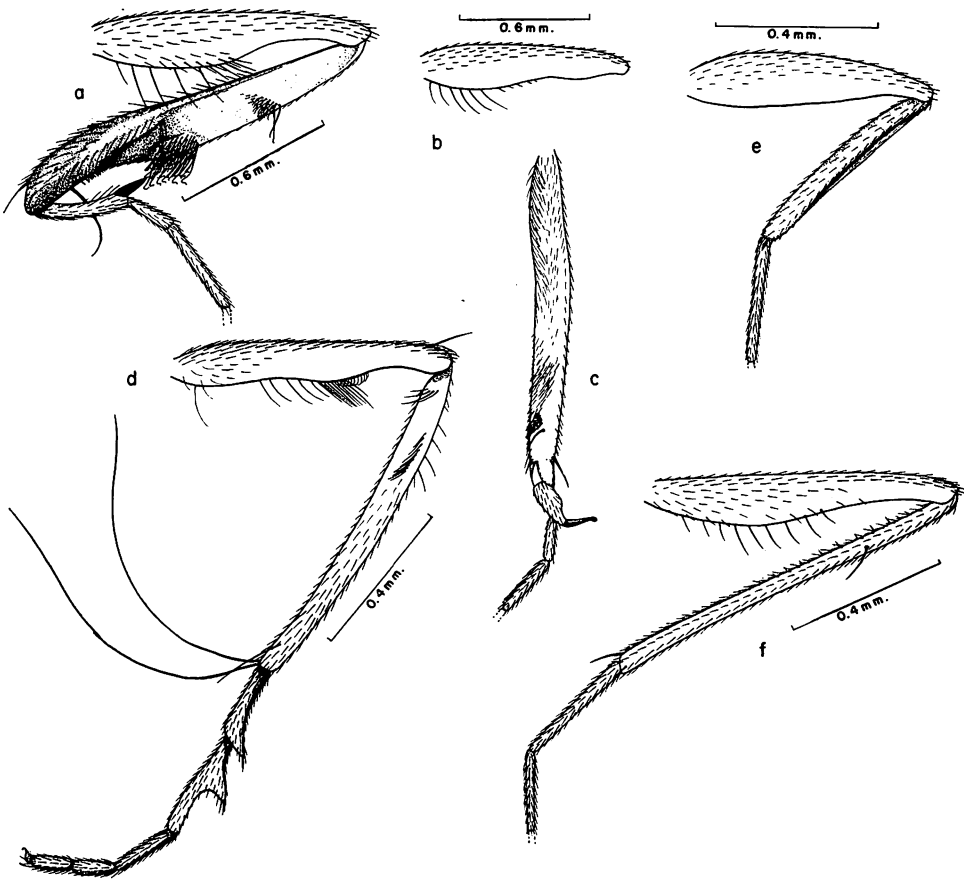


Figure 6—*Campsicnemus camptoplax* n. sp.: a, middle leg, anterior view. *C. capitulatus* n. sp.: b, middle femur, anterior view; c, middle tibia and basal tarsal segments, dorsal view. *C. carinatus* n. sp.: e, front femur, tibia, and basitarsus, anterior view; f, middle leg, anterior view. *C. chauliopus* n. sp.: d, middle leg, anterior view.

MALE. Head: The eyes are closely joined for a distance of about five rows of eye facets. The upper portion of face is gray pubescent, the lower portion is brown. Front and vertex submetallic black, covered with brown pollen. First two antennal segments yellow; third segment brown, tinged with yellow, rounded at apex, scarcely longer than wide. **Thorax:** Mesonotum and scutellum brown, densely covered with brown pollen, faintly metallic in direct light. Four pairs of dorsocentral bristles and several small acrostichals present. Upper half of each pleuron brown, lower portion yellow. Halteres yellow. **Legs:** Largely yellow. Front and hind femora discolored with brown on dorsal surfaces near apices. Front femur with a row of about six small posteroventral bristles near apex, otherwise devoid of ventral bristles. Front tibia short and thick, scarcely longer than front basitarsus. Front basitarsus equal in length to next two seg-

ments. Second tarsal segment about one-third as long as basitarsus. Third tarsal segment about two-fifths longer than second. Middle femur moderately thickened, with a row of anteroventral bristles extending from near base to about middle of segment (fig. 6b). The basal six bristles are the strongest; also with a moderately strong posteroventral bristle near apex of segment. Middle tibia strongly flattened, and gently arcuate; anteroventral and posteroventral surfaces each with a row of short erect bristles extending over the basal three-fifths of the segment; dorsal surface rather thickly covered with short, fine, inconspicuous hairs and with two patches of closely placed black setae at about apical third of segment. Also with one strong dorsal bristle at about apical fifth, on distal edge of the second patch of setae. Middle basitarsus as described above and as in figure 6c. Hind femur with moderately developed posteroventral and anteroventral setae extending over the apical half of the segment. *Wings*: Dusky fumose. Fourth costal section about one-third longer than fifth. Veins R_{4+5} and M_{1+2} parallel. Last section of M_{3+4} three to four times longer than m crossvein. *Abdomen*: Subopaque black, covered with gray-brown pollen.

Length: body, 2.25 mm.; wings, 2.75 mm.

FEMALE. Fitting the description of the male except for secondary sexual characters. The face is entirely gray pubescent and at its narrowest point is almost equal in width to two rows of eye facets.

Length: body, 2.75 mm.; wings, 3.00 mm.

Holotype male: Waikamoi, Maui, 4,000 ft., July, 1956 (D. E. Hardy). Allotype female: same data as type (R. Namba). Seven paratypes: all males, same data as type and allotype.

Type and allotype in the B. P. Bishop Museum. Paratypes in the following collections: U. S. National Museum, British Museum (Natural History), Hawaiian Sugar Planters' Association, and the University of Hawaii.

***Campsicnemus carinatus* Hardy and Kohn, new species (fig. 6e-f).**

Fitting in the group of species which has the middle basitarsus slender and not ciliated, which has no dorsal bristle on front tibia, which has the middle tibia straight with no truncate posteroventral bristles, and with no dorsal bristle present. It runs near *C. olympicolus* Parent but differs by having a row of rather well-developed, black anteroventral bristles on middle femur; by having short erect posteroventral bristles on middle tibia; and by having a distinct carina down the dorsal surface of the front tibia.

MALE. Small, chiefly dark-bodied species. *Head*: Eyes very narrowly separated on the face by a width equal to about one-third of one eye facet. Face brown pubescent. Front and vertex metallic blue-black in ground color, covered with gray-brown pollen. First two segments of antennae yellow, third segment brownish yellow, pointed at apex, about one-third longer than wide. *Thorax*: Mesonotum and scutellum dark brown, covered with brown pollen. Three pairs of dorsocentrals and just a few poorly developed acrostichals present. Humeri yel-

low, tinged with brown. Upper half of pleura largely brown, tinged with yellow, metapleura dark brown, lower half of pleura yellow. Halteres yellow. *Legs*: Yellow except for brown middle coxa. Front femur devoid of ventral bristles. Front tibia raised into a carina on dorsal surface. This extends almost the entire length of the segment (fig. 6e). Middle femur with about nine moderately developed anteroventral bristles extending from near base to apical third. Middle tibia straight and slender, with a row of short, inconspicuous posteroventral bristles as mentioned above and with two anterodorsals, one near basal third and one near apical third. Middle basitarsus about two-fifths as long as tibia and almost two-fifths longer than second tarsal segment (fig. 6f). Hind femur devoid of ventral bristles. Hind tibia with three anterodorsals, one near basal fourth, one near middle, and one near apex, and with three dorsal bristles, two rather close together near middle of segment and one just before the apex. *Wings*: Gray fumose. Fourth costal section one-fourth to one-third longer than fifth. Last section of vein M_{3+4} about three times longer than m crossvein. *Abdomen*: Subshining black, covered with gray-brown pollen.

Length: body, 1.5 mm.; wings, 2.2 mm.

FEMALE. Unknown.

Holotype male: Waikamoi, Maui, 4,000 ft., July, 1956 (D. E. Hardy).

Type in the B. P. Bishop Museum.

***Campsicnemus chauiopodus* Hardy and Kohn, new species (fig. 6d).**

Belonging to the group of species which has no projection on middle tibia but which has a projection near base of second segment of middle tarsus. It is closely related to *C. impariseta* n. sp. but differs by having two long apical hair-like bristles on middle tibia, which extend to about apical third of the tarsus, rather than one very long bristle extending to apex of tarsus; also by having the first segment of the middle basitarsus shorter than second and produced into a blunt point at apex (fig. 6d).

MALE. Entirely dark-bodied species. *Head*: Antennae dark brown to black, third segment about as wide as long, rounded at apex. Eyes separated on the upper half of the face by a distance about equal to two rows of eye facets, entire face densely gray pubescent. Front and occiput metallic blue or blue-green in ground color, rather densely brown pollinose. *Thorax*: Metallic blue-black in ground color of mesonotum, rather densely brown pollinose. Scutellum metallic blue, covered with brown pollen. Only three pairs of dorsocentral and no acrostichal bristles present. Halteres yellow, slightly tinged with brown on their knobs. *Legs*: Largely yellow, middle and hind coxae, all tarsi, and middle and hind tibiae predominantly brown. Front and hind femora slender, devoid of ventral bristles except for two moderately developed anteroventrals and two or three small posteroventrals near apex of the hind pair; the largest bristle is situated at the apical one-fifth to one-sixth of the segment and is about a fifth as long as the femur. Each hind tibia with two rows of ventral bristles extending the

entire length of the segment; these are comparatively long and strong near the base and become shorter toward the apex of the segment. Each middle femur moderately swollen on basal three-fifths, attenuated apically; with eight to ten closely placed anteroventral bristles and a row of short, curled posteroventral hairs extending over median portion of segment. Each middle tibia rather slender, flattened dorsoventrally and almost straight-sided; anteroventral surface possessing three small bristles at base and a clump of densely placed bristles at basal third of segment; the posterodorsal surface has a row of bristles extending the entire length; these are subrecumbent and are longest in the middle portion of the segment; the two elongate apical bristles arise very close together on the venter of the segment (fig. 6d). The front basitarsus terminates in a blunt point possessing two apical bristles. The second segment is about as long as the first and has a rather strong spur-like appendage situated near its base; this terminates in one or two bristles. *Wings*: Almost hyaline, slightly dusky. Fourth costal section one-half longer than fifth. Last section of M_{3+4} two and one-half times longer than m crossvein. *Abdomen*: Entirely dark brown to black, about equal to or slightly shorter than the thorax. The genitalia have not been relaxed for study.

Length: body, 1.3 mm.; wings, 2.0 mm.

FEMALE. Similar to the male except the legs are not ornamented, the face is about three facets wide at its narrowest point; the extreme upper portion is velvety black, the lower portion is gray. The third antennal segment is as wide as long.

Length: body, 1.50 mm.; wings, 2.15 mm.

Holotype male: Puu Kolekole, Molokai, 3,600 ft., July, 1952 (D. E. Hardy); allotype female: same locality as type, July, 1953 (M. Tamashiro); five paratypes: two males, three females, same data as type and allotype; and one specimen, Kainalu, Molokai, 2,100–2,500 ft., July 29, 1927 (E. H. Bryan, Jr.).

Type and allotype in the B. P. Bishop Museum; paratypes distributed among the following collections: U. S. National Museum, Hawaiian Sugar Planters' Association, and the University of Hawaii.

***Campsicnemus ciliatus* Van Duzee (fig. 7a).**

Campsicnemus ciliatus Van Duzee, 1933, Proc. Haw. Ent. Soc. 8:315, fig. 15.

Endemic. Oahu (type locality: Mt. Kaala).

Type (in poor condition) in the Hawaiian Sugar Planters' Association collection. Known only from the type.

Fitting in the group of species which has the middle tarsi ciliated and the basitarsi simple and slender; also with five pairs of dorsocentral bristles on the mesonotum. It runs near *C. fumipennis* Parent but is not related to that species. It differs strikingly by being much smaller, lacking fumose markings on the wings, and having the middle tibia slightly swollen, compressed dorsoventrally,

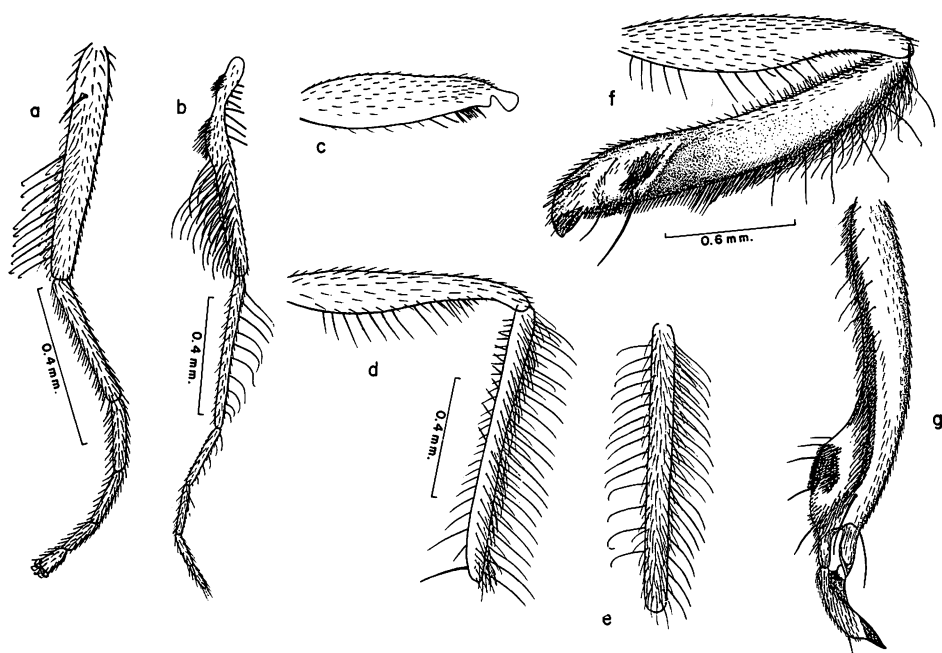


Figure 7—*Campsicnemus ciliatus* Van Duzee: a, middle tibia and tarsus, dorsal view. *C. clinotibia* n. sp.: b, middle tibia and tarsus, dorsal view; c, middle femur, anterior view. *C. comatus* n. sp.: d, middle femur and tibia, anterior view; e, middle tibia, dorsal view. *C. compressus* n. sp.: f, middle femur and tibia, anterior view; g, middle tibia and basitarsus, dorsal view.

with one anterodorsal bristle on basal fourth and a row of long anterior bristles on the apical one-half.

Small dark-bodied species. Antenna yellow-brown. Thorax entirely dark brown to black, dusted with brownish gray on the mesonotum. Acrostichals well developed and arranged in two irregular rows. Legs of type in rather poor condition. Middle femur slender, apparently lacking ventral bristles except for three or four fine brownish yellow, hair-like anteroventral bristles situated at middle of segment. Middle tibia as described above and as in figure 7a. Tarsi with moderately long ciliation on the anterior surface of all segments. Basitarsus slender, about two-thirds longer than second tarsal segment, and over half as long as the tibia. Wings hyaline.

Length: body, 1.6 mm.; wings, 2.0 mm.

***Campsicnemus clinotibia* Hardy and Kohn, new species (fig. 7b–c).**

Fitting in the group of species which has the three basal tarsal segments of middle legs ciliated and the basitarsus simple. It is differentiated from related species by the strongly bent middle tibia, armed with a row of truncate black

posteroventral bristles near base and with numerous long cilia on anterior and anterodorsal margins (fig. 7b).

MALE. *Head:* Eyes joined on front for a distance of about four or five rows of eye facets. Lower portion of face gray pubescent. Front and vertex metallic blue-black in ground color, rather densely brown pollinose. First two antennal segments chiefly yellow, the second brown at apex. Third segment brown, tinged with yellow at the base, triangular in shape, rather sharp pointed, almost two times longer than wide. *Thorax:* Predominantly yellow, brown in the median portion of mesonotum, also with a brown spot on metapleura and sides and median portion of metanotum. Only three pairs of dorsocentral bristles and a few distinct acrostichal setae present. Halteres clear yellow. *Legs:* Almost entirely yellow, middle coxa brown on outside surface. Front and hind femora devoid of ventral bristles except at extreme apices. Middle femur moderately swollen, slightly concave on anterior surface just beyond middle, very strongly attenuated at apex, also with a flat, slightly lobate process developed on anteroventral surface just before the attenuation; ventral surface with numerous strong bristles extending from apical two-fifths to about apical fourth of segment; no bristles present below the middle (fig. 7c). Middle tibia rather slender, strongly bent at apical third, with blunt posteroventral bristles extending over the basal third; anteroventral, anterior, and anterodorsal surfaces of tibia densely covered with long hairs on the apical two-thirds of segment; anterodorsal surface also with a dense clump of short setae at basal third and another at base of segment (fig. 7b). The first three segments of middle tarsus have long yellow ciliation along the anterior surface and the basitarsus has long yellow-brown to brown cilia extending down the anterodorsal surface. The basitarsus is slender, it is slightly more than two times longer than second tarsal segment and nearly two-thirds as long as tibia. Hind basitarsus rather short and thick, not much longer than second segment and about one-third as long as tibia. *Wings:* Slightly brown fumose. Fourth costal section a little shorter than fifth. Last section of M_{3+4} two and one-half times longer than m crossvein. *Abdomen:* Entirely dark brown to black. The genitalia have not been relaxed for study.

Length: body, 1.60 mm.; wings, 2.25 mm.

FEMALE. Unknown.

Holotype male: Manawainui Valley, Molokai, August, 1953 (D. E. Hardy).

Type in the B. P. Bishop Museum.

***Campsicnemus comatus* Hardy and Kohn, new species (fig. 7d-e).**

Fitting in the group of species which lacks ciliation on middle tarsus and which has the middle basitarsus slender. It fits nearest to *C. hispidipes* n. sp. but differs by having long ciliation down the posterodorsal surface of middle tibia (fig. 7d).

MALE. *Head:* Eyes joined on the face for a distance equal to about three eye facets. Lower and upper portion of face yellow-brown pubescent. Front and

vertex shining black in ground color, densely covered with yellow-brown pollen. First two antennal segments yellow, third segment brown, tinged with yellow, triangular in shape about two-thirds longer than wide. *Thorax*: Mesonotum and scutellum dark brown, covered with brown pollen. Humeri and portion of mesonotum just above wing bases yellow. Each pleuron largely yellow, tinged with brown on upper half. Four pairs of strong dorsocentral bristles and one row of rather weak acrostichals confined to anterior third of mesonotum. Halteres yellow. *Legs*: Largely yellow, dorsal surface of hind femur brown on apical half. Front femur devoid of ventral bristles. Front basitarsus about three-fourths as long as the tibia. Middle femur slender, somewhat attenuated just before apex, with a row of moderately developed ventral bristles extending from near basal sixth to about apical fourth. Middle tibia straight, posteroventral surface with a row of moderately developed bristles extending the entire length of the segment, these are about equal in length to the width of the segment; entire dorsal surface densely covered with fine ciliation, the hairs in the posterodorsal row are the longest, these are almost two times longer than the hairs of the anterodorsal row (fig. 7e). Middle basitarsus about half as long as tibia and about one-third longer than second segment. Hind femur devoid of ventral bristles. Hind tibia with three anterodorsals, one near basal sixth, one at apical two-fifths, and one preapical; also with three dorsal bristles, one at basal third, one at apical third, and one just before the apex. *Wings*: Slightly fumose. Fourth costal section about one-third longer than fifth. Last section of M_{3+4} about four times longer than m crossvein. *Abdomen*: Dark brown to black, densely covered with gray-brown pollen.

Length: body, 2.00 mm.; wings, 2.45 mm.

FEMALE. Unknown.

Holotype male: Waikamoi, Maui, 4,000 ft., July, 1956 (D. E. Hardy).

Type in B. P. Bishop Museum.

***Campsicnemus compressus* Hardy and Kohn, new species (fig. 7f-g).**

Fitting in the group of species which has the middle tibia flattened antero-posteriorly and which has the middle basitarsus short and with an apical spur. It fits closest to *C. crassipes* n. sp., from Hawaii, but the middle tibia is quite differently developed, it is not completely twisted, and the ciliation is different (fig. 7g); also the third tarsal segment of front leg is one-third longer than second, and the middle femur has well-developed posteroventral bristles.

MALE. Moderate-sized species. *Head*: Eyes contiguous or nearly so for a distance equal to about three rows of eye facets. Lower portion of face gray-pubescent, upper portion yellow-gray. Front and vertex metallic black in ground color, rather densely gray-brown pollinose. Antenna yellow, tinged with brown on the margin of the third segment; third segment obtuse at apex, about one-half longer than wide. Arista rather long pubescence. *Thorax*: Largely brown to black; lower half of pleura, the humeri, sides of metanotum, and under portion

of scutellum yellow. Mesonotum polished black in ground color rather densely gray-brown pollinose. Four pairs of strong dorsocentral bristles and a few rather weak acrostichals present. Halteres clear yellow. *Legs*: Predominantly yellow. Front tibia somewhat flattened and completely bare on dorsal surface, with a row of moderately long, erect cilia extending down each posterodorsal and each anterodorsal surface; these are approximately two-thirds the width of the segment. Front basitarsus slender, curved, about two-thirds as long as tibia. Front femur lacking ventral bristles except at extreme apex. Front coxa with just a few short, black setae scattered over the dorsal surface. Middle femur moderately stout with ventral bristles extending almost the entire length of the segment; these are shorter more closely placed on the apical third. Middle tibia enlarged, strongly flattened on anterior surface, posterior surface devoid of bristles or long hairs except for a row of rather closely placed erect, posteroventral bristles on basal half of segment; dorsal surface with rather widely spaced bristles extending from base to middle of segment. Anterodorsal surface of middle tibia with a row of densely placed cilia extending the entire length of the segment, those on the basal half are strongly curled at apices. Anterior surface with two closely placed, dense patches of short black setae near apical fourth of segment (fig. 7f), and with four rather strong anteroventral bristles at apical third. The middle basitarsus (fig. 7g), not counting the strong black apical spur, is slightly less than half as long as second segment. *Wings*: Rather lightly fumose. Fourth costal section two-thirds longer than fifth. Last section of M_{3+4} two and one-half times longer than the m crossvein. *Abdomen*: Black in ground color, predominantly brown pollinose; posterior lateral margins of terga indistinctly gray; in direct light the abdomen is submetallic. The genitalia are brownish yellow. The cerci are large, rather oval, densely covered with yellow hairs; the genitalia have not been relaxed for study.

Length: body, 3.25 mm.; wings, 4.00 mm.

FEMALE. Unknown.

Holotype male: Mt. Kaala, Oahu, July 25, 1946, "in bog at summit, 4,000 ft." (W. W. Wirth).

Type in the U. S. National Museum.

***Campsicnemus congregatus* Malloch (fig. 8a-b).**

Campsicnemus congregatus Malloch, 1932, *Stylops* 1:123.

Endemic. Oahu (type locality: Palolo). Known only from the type.

Type in the B. P. Bishop Museum.

Fitting in the group of species which has a short middle basitarsus bearing an apical spur. Apparently close to *C. putillus* Parent and differing by having only one large anterodorsal bristle on apical portion of middle tibia.

The following description is based upon the type male. Entire body and legs pale testaceous yellow. Antennae yellow, third segment densely pilose and

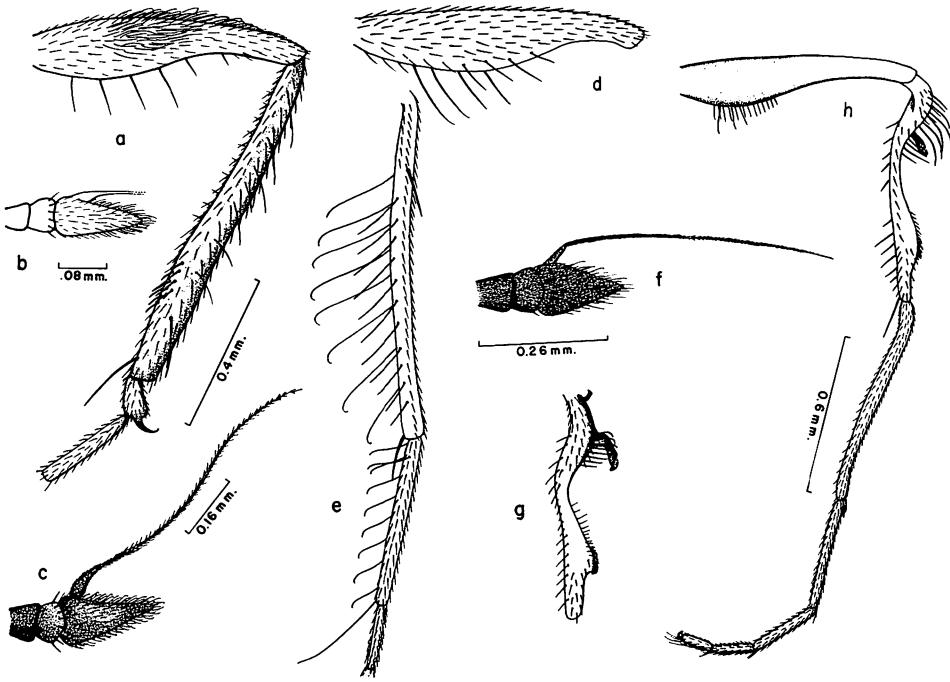


Figure 8—*Campsicnemus congregatus* Malloch: a, middle leg, anterior view; b, antenna. *C. coniculus* n. sp.: c, antenna; d, middle femur, anterior view; e, middle tibia and basitarsus, dorsal view. *C. contortus* Parent: f, antenna; g, middle tibia, dorsal view; h, middle leg, anterior view.

cone-shaped, three times longer than wide (fig. 8b). All thoracic bristles yellow, tinged lightly with brown. Four pairs of well-developed dorsocentrals present. Just a few inconspicuous acrostichals present on the anterior portion of mesonotum; Malloch said, "Acrostichal setulae quite well developed, biseriate." Front and hind legs not ornate. Middle femur thickened basally and attenuated apically, with a row of about six posteroventral bristles extending from about basal third to apical third of segment, and with rather densely placed fine pale bristly hairs on the anterior and anterodorsal surfaces which extend most of the length of the segment and which are directed apically. The middle tibia is nearly straight-sided, more thickened at about apical third and slightly flattened dorso-ventrally; one strong anterodorsal bristle is present at about apical fifth, opposite the lower edge of the clump of short black bristles on anterior surface (fig. 8a); the posteroventral surface has a row of erect, pointed bristles extending most of the length of the segment. Middle basitarsus short, slightly curved; not counting the spur it is slightly less than half as long as the second tarsal segment; produced at apex on anterodorsal angle and bearing a strong curved black spine (fig. 8a). Wings almost hyaline. Fourth costal section about equal to fifth. Last section

of M_{3+4} two and one-half times longer than m crossvein. Abdomen and genitalia entirely yellow.

Length: body, 1.70 mm.; wings, 2.27 mm.

Campsicnemus coniculus Hardy and Kohn, new species (fig. 8c-e).

It fits in the group of species which has the eyes widely separated on the face. By lacking truncate posteroventral bristles on middle tibia it fits near *C. ephydrus* n. sp., but is differentiated by having rows of hooked hairs down the anteroventral and anterior surfaces of middle tibia; by the middle tarsus having a large hair-like bristle at apex (fig. 8e), and by the chiefly yellow legs.

MALE. Moderate-sized, black-bodied species. *Head:* Face broad, densely gray pubescent; at the narrowest point the face is equal in width to about six rows of eye facets. Front and vertex metallic blue-black in ground color, covered with gray-brown pollen. Antennae brown, tinged with yellow. The third segment is rather long pointed, cone-shaped, slightly more than two times longer than wide (fig. 8c). *Thorax:* Metallic green to blue-black in ground color, gray on the sides, gray-brown on the dorsum, metallic green in the middle of scutellum, and metallic blue-black in middle of mesonotum as seen in direct light. Five pairs of strong dorsocentrals present and two rows of irregularly placed well-developed acrostichals. Halteres yellow. *Legs:* Predominantly yellow. Front femur slender, devoid of ventral bristles. Dorsal bristle of front tibia situated at basal two-fifths of segment. Front basitarsus slender, almost four-fifths as long as tibia. Middle femur moderately swollen, with rather well-developed anteroventral bristles arranged between basal third and apical third of segment (fig. 8d). Middle tibia very slightly curved, anteroventral surface with a row of long, hooked cilia arranged from about basal third to near apex. Anterior surface with a row of shorter cilia extending over apical two-thirds; one strong dorsal bristle present near basal fourth of segment; no posteroventral bristles and ventral surface with only a few suberect, short hair-like bristles in median portion. Middle basitarsus almost three-fifths as long as tibia and nearly three times longer than second tarsal segment, with a row of long cilia extending along entire length of anteroventral margin and with a long bristle at apex (fig. 8e). Hind femur devoid of ventral bristles. Hind tibia with four anterodorsals and five dorsal bristles. *Wings:* Lightly fumose. Fourth costal section about one-half longer than fifth. Last section of M_{3+4} about three times longer than m crossvein. *Abdomen:* Entirely black, covered with brownish gray pollen, with a coppery sheen in direct light.

Length: body, 2.85 mm.; wings, 3.40 mm.

FEMALE. Similar to the male except for secondary sexual characters. The middle femur has a strong anterior bristle just before the apex and also a strong preapical posterior bristle (the male also has this). The face is entirely gray and is equal in width to about six rows of eye facets. The third antennal segment is almost as wide as long.

Length: body, 3.00 mm.; wings, 3.55 mm.

Holotype male: Kula Pipeline, above Waikamoi, Maui, 4,000 ft., July, 1956 (D. E. Hardy). Allotype female: same data as type (R. Namba).

Type and allotype in the B. P. Bishop Museum.

Campsicnemus contortus Parent (fig. 8f–h).

Campsicnemus contortus Parent, 1938, Konowia 16:75, figs. 8, 9.

Endemic. Molokai (the original description gave the type locality as "Moalua Stream, 2,100 ft.," the holotype male is labeled "Moala Str."; both of these are obviously incorrect; it should be Moaula Stream).

Type in the Hawaiian Sugar Planters' Association collection.

Fitting in the complex of species which has a rather slender, pointed projection near base of middle tibia and a swollen area at apical third of tibia; also which has the middle basitarsus longer than the tibia. It is closely related to *C. lepidochaites* n. sp. from Lanai but is differentiated by having a pointed projection at apical third of middle tibia and by lacking flat scale-like bristles except at base of segment; also by other details of the middle legs as shown in figure 8h, and by having the hind femur with five or six long anteroventral bristles.

Third segment of antenna rather sharply pointed but only one-half to three-fourths longer than the greatest width (fig. 8f). Body predominantly dark brown to black. Lower portion of pleura yellow-brown. Knobs of halteres brown, stems yellow. Ground color of mesonotum shining black, densely gray pollinose. Scutellum metallic blue in direct light, more lightly brown dusted than mesonotum. Legs predominantly yellow. Front femora without ventral bristles. Hind femora with five or six elongate anteroventral bristles extending from about middle to apical fourth and with shorter bristles extending to the base. Each middle femur rather thickly swollen at base, attenuated on the apical half; the anteroventral and anterior surface of the swollen portion is rather thickly covered with moderately long, yellow hairs or bristles; lacking a row of anteroventral bristles near apex of segment. Each middle tibia rather strongly curved on the anterior margin in the median portion, with a row of short black posterodorsal bristles on about apical third, but lacking bristles on the other surfaces beyond the curved portion. The sub-basal projection is rather slender and somewhat twisted (fig. 8g). A row of eight to ten pale brown anterodorsal bristles is situated above the sub-basal projection and also a row of three or four very closely placed (appearing confluent) yellow bristles is situated behind the basal projection (this appears in Parent's figure 8 as a small projection just behind the sub-basal projection); there are no anterodorsals at base of tibia.

Length: body, 2.0–2.2 mm.; wings, 2.6 mm.

Campsicnemus cracens Hardy and Kohn, new species (fig. 9a–b).

Fitting in the group of species which has the middle tibia straight, the middle basitarsus simple and slender, and the long ciliation of middle tarsus confined

to the posterodorsal surface of basitarsus. It fits closest to *C. loxothrix*. n. sp. but is separated by having the middle basitarsus about one-half as long as the tibia and by the mid-tibia being straight and lacking the diagonal rows of bristles, etc. (fig. 9b).

MALE. Head: Eyes contiguous on the face for a distance of about five rows of eye facets. Lower portion of face brownish yellow pubescent. Front and vertex metallic blue-black in ground color, covered with gray-brown pollen. First two antennal segments yellow, third brown, rounded at apex, and as wide as long. **Thorax:** Largely yellow, upper half of pleura tinged with brown, also a brown tinge down each dorsocentral row; sometimes the entire mesonotum is discolored with brown. Four pairs of dorsocentrals and no acrostichals present. **Legs:** Predominantly yellow. Front tibia with two moderately strong posterior bristles at middle of segment and with erect posterior setae extending the entire length of the segment. Front basitarsus slender and curved, two-thirds as long as tibia. Middle femur slender, ventral bristles extending from near basal fourth to about apical fourth (fig. 9a). Middle tibia straight and slender; a row of short, erect posteroventral bristles extends from the base to about apical third of the segment; also with a row of moderately long anterodorsal bristles and long fine dorsal bristles on apical half of segment (fig. 9b). Middle basitarsus about two-thirds longer than second segment and with rather long erect cilia along posterodorsal surface. Hind tibia with three posterodorsal bristles, one on basal third, one on apical two-fifths, and one preapical. Also with two anterodorsals, one on basal one-fourth and one on middle. **Wings:** Faintly fumose. Fourth costal section one-half to two-thirds longer than fifth. Last section of M_{3+4} about three times longer than m crossvein. **Abdomen:** Entirely black, covered with gray-brown pollen. The genitalia have not been relaxed for study.

Length: body, 2.0 mm.; wings, 2.7 mm.

FEMALE. Unknown.

Holotype male: Puu Kolehaha, Molokai, 3,600 ft., July, 1953 (M. Tamashiro).

One paratype male: same data as type, except July, 1952 (D. E. Hardy).

Type in B. P. Bishop Museum. Paratype in the University of Hawaii collection.

Campsicnemus crassipes Hardy and Kohn, new species (fig. 9c-d).

In the group of species which has the middle basitarsus shortened and with a spur at the apex, and the middle tibia flattened dorsoventrally. It fits near *C. planitibia* Parent but the second tarsal segment of the front legs is not shortened and the middle tibia is completely twisted and very different in development (fig. 9d).

MALE. Head: Eyes contiguous or nearly so for about half the length of the face. Lower portion of face densely yellow-brown pubescent. Antennae yellow, third segment just slightly longer than wide, rounded at apex. Arista yellow-brown, long pubescent and inserted near the base of the third segment. Front

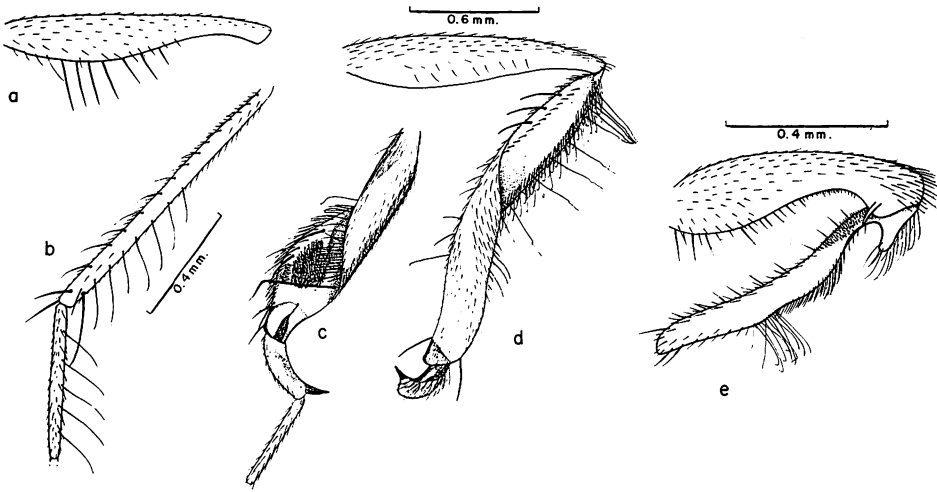


Figure 9—*C. cracens* n. sp.: a, middle femur, anterior view; b, middle tibia and basitarsus dorsal view. *C. crassipes* n. sp.: c, apex of middle tibia and basitarsus; d, middle femur, tibia, and basitarsus, anterior view. *C. crinitibia* Van Duzee: e, middle femur and tibia, anterior view.

and vertex dark brown to black, metallic blue in direct light. *Thorax*: Entirely yellow except for a large black spot covering each metapleuron and a brown spot on each side of metanotum, also with a rather faint brown vitta extending down each dorsocentral row. Four pairs of dorsocentral bristles and one row of acrostichals present. *Legs*: Entirely yellow except for brown tarsi and brown discoloration on outside surface of middle coxa. Each front femur devoid of ventral bristles or hairs except for two short, anteroventrals and one moderate-sized, posteroventral near apex. Front basitarsus rather long and slender, about two-thirds as long as tibia and densely covered with short black setae over dorsal surface, these are especially abundant on the basal third; basitarsus almost two and one-half times longer than second tarsal segment. Each middle femur moderately swollen, with a row of seven or eight anteroventral bristles situated near the middle of the segment and with six posteroventral bristles at apical third. Each middle tibia flattened dorsally, completely twisted; posterior margin lined with setae which are longer than width of the tibia and which are wavy at apex (especially on the basal half of the segment) (fig. 9d); posterior dorsal margin with a series of fine curly hairs; median dorsal portion bare; a dense patch of short bristles about half the width of the tibia on the apical one-third and a large posterodorsal on apical one-fifth (fig. 9c). Middle basitarsus curved, two-thirds as long as the following segment. Each hind femur with a row of moderately long anteroventral bristles on basal half and with a row of erect anterior bristles on about apical half of segment. Ventral surface of hind tibia with a rather dense clump of strongly bent hairs just beyond base, these are bent at right angles on about apical half. *Wings*: Almost hyaline, faintly tinged. Fourth costal

section about two times longer than fifth. Veins R_{4+5} and M_{1+2} parallel. Last section of vein M_{3+4} over three times longer than the m crossvein. *Abdomen*: Predominantly dark brown to black on the dorsum; first tergum mostly yellow, brown at apices, other terga narrowly yellow on the sides; sterna all yellow. Genitalia yellow; they have not been relaxed for study.

Length: body, 2.6 mm.; wings, 3.5 mm.

FEMALE. Unknown.

Holotype male: near Pawaina, Kona, Hawaii, 3,000 ft. Collected on ground cover in tree fern jungle, July, 1953 (D. E. Hardy).

Type in the B. P. Bishop Museum.

***Campsicnemus crinitibia* Van Duzee (fig. 9e).**

Campsicnemus crinitibia Van Duzee, 1933, Proc. Haw. Ent. Soc. 8:331, figs. 84-87.

Endemic. Oahu (type locality: Kamokuiki Valley, Waianae Mountains, 950 ft., on water).

Type in the Hawaiian Sugar Planters' Association collection. The following notes are based upon the type and upon one male taken at Palikea, Oahu, on a tiny pool, June 18, 1938 (F. X. Williams).

Fitting in the group of species which has a projection at the base of the middle tibia, the apical portion sinuate and swollen, and the hind basitarsus much shorter than the tibia. It is related to *C. sinuatus* Van Duzee, but is differentiated by having a preapical spine-like process on the enlarged apical portion of the middle femur as well as by other leg characters as shown in figure 9e.

Mesonotum shining blue to purple in ground color, rather densely brown pollinose. Scutellum greenish blue. Pleura all yellow except for brown discolorations on metapleura and upper mesopleura. Third antennal segment cone-shaped with a slender point two and one-half times longer than greatest width. Legs predominantly yellow. Basal projection of middle tibia rather densely bristled on upper surface, remainder of tibia and bristling as in figure 9e. Each middle femur rather thickly bristled on ventral portion from about apex to apical third; these bristles are longest on the basal half of the segment and become very short as they extend apically. The flattened and enlarged apex of the middle femur is rather thickly setulose above and has a short spine-like projection from the inner margin (fig. 9e). Each hind femur with five widely spaced anteroventral bristles extending almost the entire length of the segment.

Length: body, 1.8 mm.; wings, 2.4 mm.

The original description is good.

***Campsicnemus crossotus* Hardy and Kohn, new species (fig. 10a-b).**

Fitting in the group of species which has the middle tarsus without ciliation, the basitarsus slender and simple, and no dorsal bristle on front tibia or

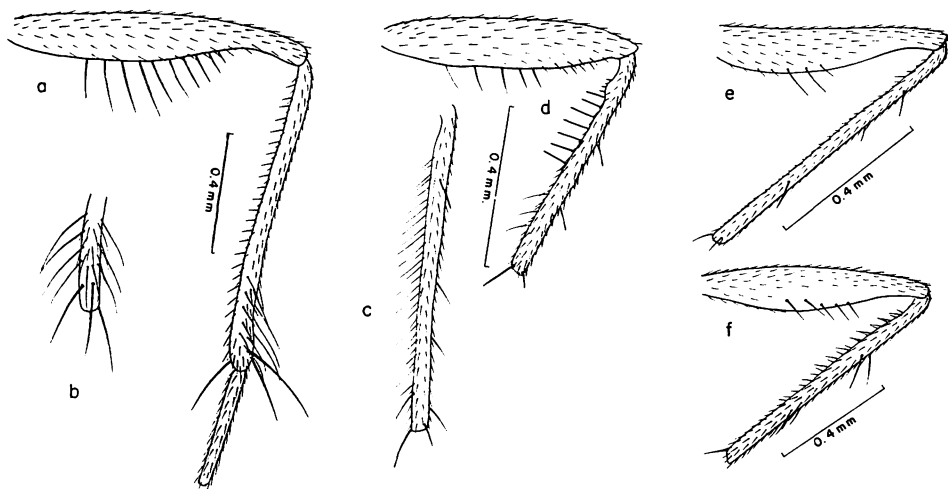


Figure 10—*Campsicnemus crossotus* n. sp.: a, middle femur, tibia, and basitarsus, anterior view; b, apex of middle tibia, dorsal view. *C. crossotibia* n. sp.: c, hind tibia, dorsal view; d, middle femur and tibia, anterior view. *C. deficiens* Parent: e, middle femur and tibia, anterior view, *C. depauperatus* Parent: f, middle femur and tibia, anterior view.

on basal half of middle tibia. It is distinguished from other species in this complex by the middle tibia having anterodorsal ciliation only on the apical one-fourth of the segment (fig. 10a).

MALE. Head: Eyes contiguous on the front for a distance equal to about five rows of eye facets. Front and vertex shining black in ground color, brown pollinose. First two antennal segments yellow, third segment brown, subacute, triangular, almost one-half longer than wide. **Thorax:** Predominantly yellow-brown, lower portion of the pleura clear yellow. Mesonotum yellow-brown pollinose, shining in the middle portion when seen in direct light. Four pairs of well-developed dorsocentrals and no acrostichals present. Halteres clear yellow. **Legs:** Largely yellow, tinged with brown on the outside surfaces of middle coxae, and on tarsi. Front femur devoid of ventral bristles except at apex. Front basitarsus slightly curved, three times longer than second tarsal segment and about three-fifths as long as tibia. Middle femur slender, with moderately long ventral bristles extending from about basal third to apical third of segment. Middle tibia straight and slender, posteroventral surface with a row of short erect setae extending the entire length of the segment; anterodorsal surface with moderately long hairs at apical third; posterodorsal surface with three or four long hairs at apical one-fourth (fig. 10a); also with a strong preapical dorsal bristle (fig. 10b). Middle basitarsus one-half longer than second tarsal segment and about one-third as long as tibia. Hind femur without ventral bristles except at apex. Anterodorsal surface of hind tibia with three bristles, one near basal third, one

near apical third, and one preapical; dorsal surface with four bristles, three situated between the middle and apical third. *Wings*: Lightly fumose. Fourth costal section two-thirds longer than fifth. Last section of M_{3+4} three times longer than m crossvein. *Abdomen*: Entirely black. The genitalia have not been relaxed for study.

Length: body, 2.2 mm.; wings, 2.6 mm.

FEMALE. Unknown.

Holotype male: Puu Kukui, Maui, 4,500 ft., April, 1954 (M. Tamashiro).

One paratype male: Puu Kukui, 3,000–4,500 ft., June, 1953 (D. E. Hardy).

Type in the B. P. Bishop Museum. Paratype in the University of Hawaii collection.

***Campsicnemus crossotibia* Hardy and Kohn, new species (fig. 10c–d).**

Fitting in the group of species which has the middle tarsus lacking fine ciliation and the middle basitarsus longer than second tarsal segment, the wings hyaline or nearly so, and the middle tibia with a row of blunt posteroventral bristles near base. It differs from other species in this complex by the hind tibia having long fine setae extending the entire length on the ventral surface (fig. 10c).

MALE. Small dark-bodied species. *Head*: Eyes closely approaching one another on the face but not contiguous. At the narrowest point the face is about one-half as wide as one eye facet. Entire face densely gray pubescent. Front and vertex metallic blue-green in ground color rather densely brownish pollinose. First two antennal segments yellow; third segment broken off the specimen at hand. *Thorax*: Dark brown to black on the dorsum, brown, tinged with yellow on the sides. Mesonotum and scutellum gray-brown pollinose but metallic blue-green down the central portion when seen in direct light. Four pairs of dorso-centrals are present, the third pair is small and poorly developed; also with one row of rather well-developed acrostichals setae. Front femur devoid of ventral bristles. Middle femur slender, slightly constricted at apex, and with posteroventral bristles extending over apical half. Middle tibia straight or nearly so, the blunt posteroventral bristles extend over the apical half of the segment; there are no strong anterior bristles; the anteroventral surface has a slight bump just before the base (fig. 10d). Middle basitarsus slender, about three-fourths longer than second segment. Hind femur devoid of ventral bristles except for three or four posteroventrals and one anteroventral at apex. Posteroventral and anteroventral surfaces of hind tibia each with a row of fine setae extending the entire length of the segment (fig. 10c). *Wings*: Hyaline or nearly so. Fifth costal section slightly longer than the fourth. Last section of M_{3+4} three times longer than m crossvein. *Abdomen*: Entirely dark brown to black. The genitalia have not been relaxed for study.

Length: body, 1.35 mm.; wings, 1.90 mm.

FEMALE. Unknown.

Holotype male: Mt. Kaala, 4,000 ft., April, 1953 (M. S. Adachi).
Type in the B. P. Bishop Museum.

Campsicnemus deficiens Parent (fig. 10e).

Campsicnemus deficiens Parent, 1939, Proc. Haw. Ent. Soc. 10:226, fig. 3.

Endemic. Oahu (type locality: Lulumahu Str., 1,900 ft., "slopes of valley").
Type in the Hawaiian Sugar Planters' Association collection.

Fitting in the group of species with the middle tarsi not ciliated, the basitarsus simple and slender, the middle tibia straight, lacking blunt bristles or conspicuous ciliation, and with no dorsal bristle on front tibia. It is related to *C. depauperatus* Parent but is differentiated by having only three pairs of dorsocentral bristles and by having but one dorsal bristle on basal third of middle tibia (fig. 10e).

A tiny predominantly yellow-brown species. Third antennal segment brown, tinged with yellow, triangular, about one-half longer than wide. Thorax yellow-brown on the dorsum, darker brown in the median portion of the mesonotum; yellow on the pleura. Middle femur slender with one rather strong and two or three small anteroventrals near middle of segment, these are all pale yellow-brown. Posteroventral surface of middle femur with only a few short erect setae. Middle tibia slender, straight, and simple, devoid of bristles or conspicuous hairs except for one anterodorsal near basal one-fourth and one small anterodorsal at about apical fourth; also with a rather strong dorsal bristle just before middle of the segment (fig. 10e). Middle basitarsus about one-half longer than second tarsal segment and about one-third as long as tibia. Wings very lightly fumose. Vein R_{2+3} curved up at its apex so that the fourth costal section is one-half to three-fourths longer than fifth. Last section of M_{3+4} three times longer than m crossvein.

Length: body, 1.15–1.30 mm.; wings, 1.60 mm.

Campsicnemus depauperatus Parent (fig. 10f).

Campsicnemus depauperatus Parent, 1939, Proc. Haw. Ent. Soc. 10:226, fig. 4.

Endemic. Oahu (type locality: Mt. Olympus).

Type in the Hawaiian Sugar Planters' Association collection.

Fitting in the group of species with the middle tarsi lacking ciliation, the basitarsus simple and slender, the middle tibia straight and lacking blunt bristles or conspicuous ciliation except for a few anterior cilia at apical third, and with no dorsal bristle on front tibia. It is related to *C. deficiens* Parent but is distinguished by having four pairs of dorsocentral bristles and by having two dorsal bristles on basal third of middle tibia (fig. 10f).

A small, chiefly brownish yellow species. Third antennal segment subacute at apex just slightly longer than wide. Thorax yellow, tinged with brown. Mesonotum densely yellow-brown pubescent. All four pairs of dorsocentrals are strongly developed and there are no acrostichal setae present. Middle femur

slender with five rather well-developed ventral bristles extending from about middle to apical third of segment. The middle tibiae are rather slender and straight and almost devoid of conspicuous ciliation except for about three anterior bristles situated at apical third, and for a moderately strong dorsal and an anterodorsal bristle situated at basal third of segment; posteroventral and anteroventral surfaces with a row of very short erect pale hairs extending from near base to about apical two-fifths of segment (fig. 10f). Middle basitarsus about two-fifths as long as tibia.

Length: body, 1.6 mm.; wings, 2.0 mm.

Campsicnemus diamphidius Hardy and Kohn, new species (fig. 11a-b).

Fitting in the group of species which lacks ciliation on middle tarsi, which has the middle basitarsus slender and simple and the middle tibia straight and bearing no blunt posteroventral bristles or long ciliation. It is related to *C. flaviventer* n. sp., but is differentiated by having the abdomen all black and the pleura predominantly brown, by having the eyes separated on the face by a width equal to two rows of eye facets, and by the middle basitarsus being less than one-fourth as long as the tibia.

MALE. *Head:* Face entirely gray pubescent. Front and vertex metallic black in ground color but rather densely brown pollinose. Antennae black, tinged with yellow-brown on the basal segments, third segment long-pointed slightly more than two times longer than wide (fig. 11b). *Thorax:* Scutellum and metanotum dark brown to black. The vitta down each dorsocentral row varies from brown to black and is very broad, the two are almost confluent on the hind margin of the mesonotum. The pleura are mottled yellow and brown; the median portion and the sides of the mesonotum are yellow. Five pairs of dorsocentrals and one row of moderately strong acrostichal setae present. Metanotum with five strong bristles on each side. Halteres clear yellow. *Legs:* Front coxae and all femora yellow, legs otherwise brown to black, except for a yellow tinge in ground color of the front tibiae. Front femur slender without ventral bristles. Front tibia with one strong dorsal bristle at basal two-fifths of segment. Front basitarsus straight and slender, two-thirds as long as the tibia. Middle femur moderately slender, ventral surface with several rows of moderately strong bristles extending over the apical half; the basal portion has a number of slender erect hairs, more sparsely scattered than those on the apical portion. Middle tibia rather long and straight, with a row of erect posteroventrals and about two rows of shorter ventral bristles extending over about the basal half of the segment. Middle basitarsus about one-third longer than second tarsal segment and less than one-fourth as long as the tibia (fig. 11a). Hind femur with erect setae extending almost the entire length of the segment down each anteroventral and posteroventral surface. Hind tibia with five anterodorsal bristles and four dorsal bristles. Hind basitarsus about one-fourth as long as tibia. *Wings:* Distinctly infuscated, darker along the m crossvein. Vein R_{4+5} slightly arched so that cell R_5 is some-

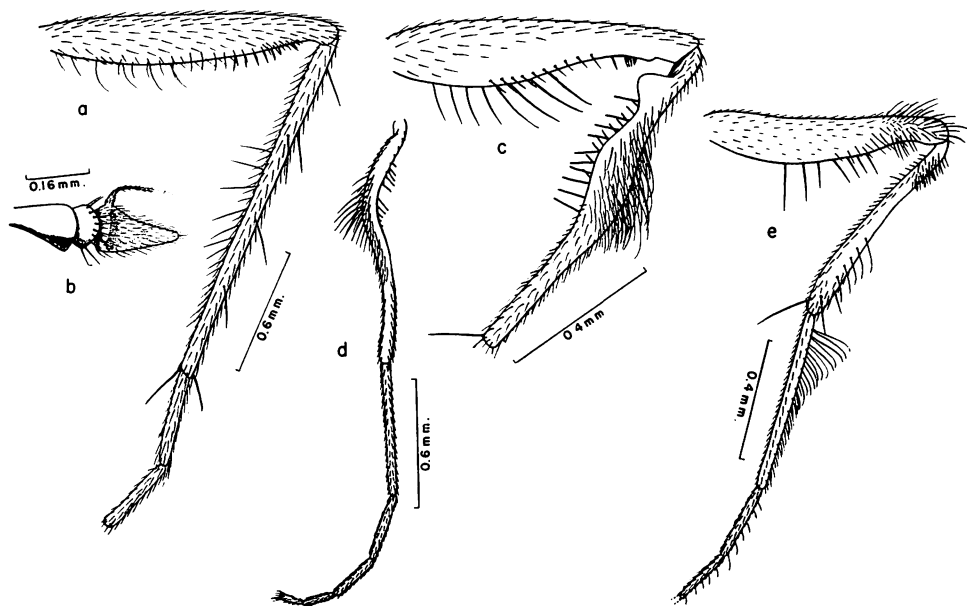


Figure 11—*Campsicnemus diamphidius* n. sp.: a, middle leg, anterior view; b, antenna. *C. dicondylus* n. sp.: c, middle femur and tibia, anterior view; d, middle tibia and tarsus, dorsal view. *C. diffusus* n. sp.: e, middle leg, anterior view.

what narrowed at the apical portion. The fourth costal section is two times longer than fifth and the last section of vein M_{3+4} is not quite two times longer than the m crossvein. *Abdomen*: Entirely black in ground color, gray on the venter, on sides of terga and on genitalia. The genitalia have not been relaxed for study.

Length: body, 3.0–3.4 mm.; wings, 4.0–4.2 mm.

FEMALE. Much like the male although the wings are more brown fumose; the leg bristles are not the same; the third antennal segment is rounded at apex and is about as wide as long; the femora are discolored with brown and the dorsum of the thorax tends to be more extensively brown than in the male.

Holotype male, allotype female, and four paratypes (one male and three females): from Paliku, Haleakala Crater, Maui, 6,500 ft., June–August, 1952, and June, 1953 (Mr. Tamashiro, D. E. Hardy, W. C. Mitchell, and C. R. Joyce).

Type in the B. P. Bishop Museum. Paratypes in the following collections: U. S. National Museum, British Museum (Natural History), Hawaiian Sugar Planters' Association, and the University of Hawaii.

***Campsicnemus dicondylus* Hardy and Kohn, new species (fig. 11c–d).**

Fitting in the group of species which has the middle tibia curved and bearing a subapical lobe. It is related to *C. amblytylus* n. sp. but is differentiated by

having the middle femur with the posteroventral bristles arranged at the middle of the segment and by having a small preapical projection on the anterior ventral surface (fig. 11c).

MALE. Small, predominantly pale-colored species. *Head:* Antennae yellow, tinged with brown on the third segment, third segment sharp pointed at apex about two-thirds longer than wide. Eyes contiguous or nearly so in the middle of the face for a distance equal to the length of about four or five rows of eye facets. Lower portion of the face yellow pubescent, upper portion dark gray to black. Front, metallic green in ground color, rather densely covered with brown. Vertex metallic green. *Thorax:* Yellow, except for a large brown to black spot on the upper portion of metapleura, a brown spot on each side of metanotum, and a brown vitta extending down each dorsocentral row. Four pairs of dorsocentral bristles and one row of acrostichal setae present. Halteres yellow. *Legs:* Entirely yellow except for slight brown discolorations on the middle coxae and on the tarsi. Each front femur devoid of ventral bristles except for a row of five or six posteroventrals at apex. Each middle femur moderately swollen, with a small knob produced on anteroventral surface just before the apex; the posteroventral bristles are strong and extend from basal third to one-fourth to the apical fourth of the segment and are continuous with a row of small bristles which curves across the preapical portion of the tibia and extends around the edge of the knob-like projection. Anteroventral bristles are short, extending from near middle of segment to the projected portion. Each middle tibia contorted, rather strongly curved, swollen at basal third and with a small projection on anterior margin near base, opposite the projection at apex of femur (fig. 11c); the basal half of the tibia has two rows of strong, blunt, anterodorsals and a large dense clump of moderately long hair-like bristles on the anteroventral surface. The middle basitarsus is long and slender. It is equal in length to the next two segments and is almost one-half as long as the tibia (fig. 11d). Hind femur slender without strong bristles on the venter. *Wings:* Slightly fumose, fourth costal section one-half longer than fifth. Last section of M_{3+4} two and one-half times longer than m crossvein. *Abdomen:* Yellow, brown at the apices of the terga. About equal to or slightly shorter than the thorax. The genitalia have not been relaxed for study.

Length: body, 1.65 mm.; wings, 2.50 mm.

FEMALE. Unknown.

Holotype male: Keanakolu, Hawaii, 5,200 ft., October, 1952 (D. E. Hardy). Six paratype males: four same data as type; one, Kulani, Hawaii, 5,200 ft., August, 1952 (W. C. Mitchell); and one, Keauhou Ranch, Kilauea, Hawaii, July, 1953 (D. E. Hardy). The specimens were collected sweeping the ground litter in very wet areas.

Type in the B. P. Bishop Museum. Paratypes distributed among the following collections: U. S. National Museum, British Museum (National History), Hawaiian Sugar Planters' Association, and the University of Hawaii.

***Campsicnemus diffusus* Hardy and Kohn, new species (fig. 11e).**

Fitting in the group of species with the middle basitarsus longer than second tarsal segment and lacking an apical spine; with the first two basal tarsal segments on middle leg with fine erect ciliation, and the third segment longer than second; the middle femur concave near middle as seen in dorsal view; also with the middle tibia just slightly curved, rather thickened, and just slightly longer than middle basitarsus (fig. 11e). It fits closest to *C. brevitibia* n. sp. but lacks the well developed antero- and posterodorsal rows of hooked setae on apical three-fourths of middle tibia.

MALE. A moderately small, dark bodied species. *Head:* Eyes contiguous on the face for a distance equal to about four or five rows of eye facets. Lower portion of the face gray pubescent. Antennae yellow, tinged with brown, third segment subacute, about one-half longer than wide. Front and vertex black in ground color, covered with gray-brown pollen, faintly shining. *Thorax:* Entirely black, gray-brown pollinose on the dorsum, gray on the sides, subshining on mesonotum and scutellum. Four pairs of dorsocentral bristles and no acrostichals present. Halteres yellow, tinged with brown on their knobs. *Legs:* Predominantly yellow, middle coxae and apical segments of tarsi tinged with brown. Front femur moderately stout, lacking ventral bristles. Front tibia short. Front basitarsus rather slender and curved slightly, about two times longer than second segment and a little over two-thirds as long as tibia. Middle femur moderately thickened, with a group of four to six rather long yellow-brown anterior bristles near apical fourth, anteroventral surface with eight or nine moderately strong hairlike bristles. Middle tibia rather short, very slightly flattened and slightly bent, with a row of short erect posteroventral setae extending the entire length of the segment, anterior surface with a clump of short erect setae near basal fourth and with a few long curved hairs just before the apex. First two middle tarsal segments densely ciliated on their anterior surfaces. Basitarsus long and slender, two and one-half times longer than second segment and almost as long as tibia (fig. 11e). Hind femur devoid of distinct ventral bristles except for four rather small posteroventrals at apex, anteroventral surface with a row of suberect short setae. *Wings:* Lightly fumose. Fourth costal section one-third longer than fifth. Last section of M_{3+4} two and one-half times longer than m crossvein. *Abdomen:* Entirely black. The genitalia have not been relaxed for study.

Length: body, 1.7 mm.; wings, 2.3 mm.

FEMALE. Unknown.

Holotype male: Keanakolu, Hawaii, 5,200 ft., October, 1952 (D. E. Hardy). Five male paratypes, from the following localities: Kahuaawi Gulch, Molokai, July, 1952 (D. E. Hardy); Manawainui Valley, Molokai, July, 1952 (D. E. Hardy); Waikolu Valley, 1,400 meters, May, 1955 (C. R. Joyce); and Lanaihale, Lanai, 3,200 ft., June, 1953 (D. E. Hardy).

Type in the B. P. Bishop Museum. Paratypes in the following collections:

U. S. National Museum, Hawaiian Sugar Planters' Association, and the University of Hawaii.

***Campsicnemus disjunctus* Hardy and Kohn, new species (fig. 12a).**

Fitting in the group of species which has the middle basitarsus slender and without ciliation and which lacks a dorsal bristle on the front tibia and truncate posteroventral bristles or anterodorsal ciliation on middle tibia. It fits near *C. exiguus* n. sp. but is differentiated by the strongly curved middle tibia, by the presence of two strong anterior bristles on apical fourth, and one strong ventral bristle near middle of middle tibia (fig. 12a).

MALE. Small, chiefly pale-colored species. *Head:* Eyes narrowly separated on the face, at its narrowest point the face is slightly less than the width of one eye facet. Entire face yellow-gray pubescent. Front and vertex shining black in ground color, rather thickly gray-brown pollinose. Antennae yellow, third segment triangular, about one-half longer than wide. *Thorax:* Entirely yellow except for a black spot on metapleura. Four pairs of rather well-developed dorsocentral bristles, plus one pair of hair-like dorsocentrals near anterior margin. One row of acrostichals extending nearly three-fourths the length of the mesonotum. *Legs:* Almost entirely yellow. Front legs not ornate. Middle femur moderately swollen on basal portion and attenuated at apex, with a row of moderately strong anteroventral bristles extending from about the basal one-fifth to the apical third of the segment. Middle tibia strongly bent on basal half, posteroventral surface with a row of rather well-developed pointed bristles extending to beyond middle of segment; anterodorsal and anterior surface with a clump made up of several moderately developed black bristles and numerous short hairs situated at basal third of segment. One strong anterior bristle is situated at apical fourth and another is situated just before the apex of the segment; one strong anteroventral bristle is situated near the apical fourth and one very strong, pale anteroventral bristle is situated near middle of segment (fig. 12a). Middle tarsi not ciliated. Basitarsus about half as long as tibia and approximately two times longer than second segment. Hind femur devoid of ventral bristles. Hind tibia with three anterodorsals and two dorsals, one near basal fourth and one preapical. *Wings:* Lightly fumose. Fifth costal section equal in length to the fourth. The last section of M_{3+4} about three times longer than m crossvein. *Abdomen:* Dark brown to black, covered with gray pollen.

Length: body, 1.3 mm.; wings, 2.0 mm.

FEMALE. Unknown.

Holotype male and two male paratypes: Kula Pipeline, above Waikamoi, Maui, 4,200 ft., July, 1956 (R. Namba).

Type in B. P. Bishop Museum. Paratypes in the U. S. National Museum and the University of Hawaii collection.

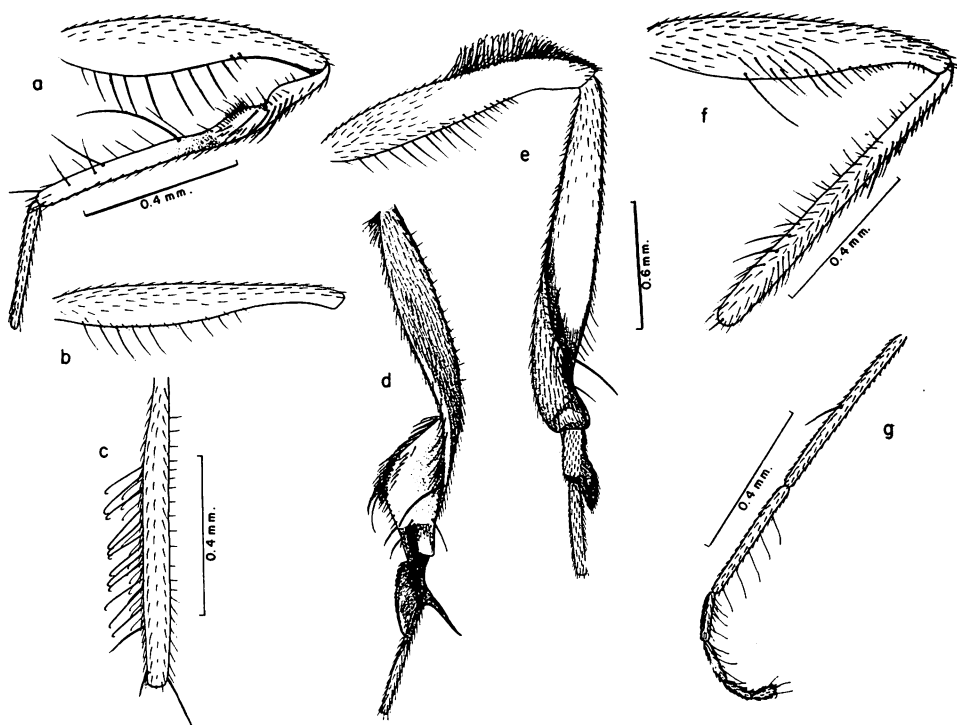


Figure 12— *Campsicnemus disjunctus* n. sp.: a, middle femur, tibia, and basitarsus, anterior view. *C. distinctus* n. sp.: b, middle femur, anterior view; c, middle tibia, posterior view. *C. distortipes* Grimshaw: d, middle tibia and basal two tarsal segments, dorsal view; e, middle femur, tibia, and basal two tarsal segments, anterior view. *C. drymoscartes* n. sp.: f, middle femur and tibia, anterior view; g, front tibia and tarsus, dorsal view.

***Campicnemus distinctus* Hardy and Kohn, new series (fig. 12b–c).**

Fitting in the group of species which lacks ciliation on middle tarsi and which has the basitarsus slender; lacks a clump of dorsal bristles or blunt postero-ventral bristles or anterodorsal or dorsal bristles on basal half of middle tibia; and also which lacks a dorsal bristle on front tibia. It differs from other species in this complex by having a row of black anterodorsal bristles extending from the basal fourth to apical fourth of the middle tibia and by having three pairs of dorsocentral bristles. Also the gray pollinosity of the mesonotum is distinctive.

MALE. Moderately small, chiefly dark-bodied species. *Head:* Eyes joined on the face for a distance equal to about four rows of eye facets. Face yellow to yellow-brown pubescent. Front and vertex submetallic black in ground color, rather densely yellow-brown pollinose. First two segments of antenna yellow. Third segment yellow at base, tinged with brown apically, cone shaped, about two times longer than wide. *Thorax:* Brown to black in ground color, predominantly covered with gray pollen, this is more brownish gray on the mesonotum.

Three pairs of well-developed dorsocentrals and no acrostichals present. Halteres yellow. *Legs*: Predominantly yellow. Front femur devoid of ventral bristles. Front tibia almost as long as the femur. Front basitarsus about four-fifths as long as the tibia. Middle femur with six to eight moderately developed antero-ventral bristles extending from about basal third to apical third of segment (fig. 12b), also with a few short posteroventral setae. Middle tibia straight, with a row of rather well-developed anterodorsal bristles extending from basal fourth to apical fourth and with a row of short erect posteroventral bristles extending the entire length of the segment (fig. 12c). Tarsi not ciliated. Middle basitarsus about half as long as tibia and about equal in length to next two tarsal segments. Hind femur with a row of short erect setae extending from about basal third to apical third. *Wings*: Dusky fumose. Fifth costal section about equal in width to the fourth. Veins R_{4+5} and M_{1+2} parallel. Last section of M_{3+4} about three times longer than m crossvein. *Abdomen*: Submetallic black in ground color, covered with gray-brown pollen. Rather short, about equal in length to the thorax.

Length: body, 1.5–1.7 mm.; wings, 2.2 mm.

FEMALE. Similar to the male except for secondary sexual characters. The face is narrowed to about the width of one eye facet in the median portion. The third antennal segment is rather rounded at apex and is as wide as long.

Holotype male and allotype female: Waikamoi, Maui, 4,000 ft., July, 1956 (D. E. Hardy). Thirty-six paratypes, 24 males and 12 females: mostly same data as type (D. E. Hardy and R. Namba) and from Kula Pipeline, above Waikamoi, Maui, 4,200 ft., July, 1956 (D. E. Hardy and R. Namba).

Type, allotype, and a series of paratypes in the B. P. Bishop Museum. Remainder of paratypes in the following collections: U. S. National Museum, British Museum (Natural History), Hawaiian Sugar Planters' Association, State Department of Agriculture, and the University of Hawaii.

***Campsicnemus distortipes* Grimshaw (fig. 12d–e).**

Campsicnemus distortipes Grimshaw, 1901, *Fauna Hawaiiensis* 3:14, pl. 1, figs. 23–24.

Endemic. Hawaii (type locality: Kilauea). It is rather common on the forest floor of the slopes of Hualalai, 4,000–6,000 ft., and on the Kona slopes of Mauna Loa, 4,000–5,000 ft.

Type in the British Museum (Natural History). The senior author has studied the type.

Fitting in the group of species which has no projection on middle tibia, which has the middle basitarsus shorter than the second tarsal segment and flattened and lobate at apex. It fits near *C. membranilobus* Parent but is distinguished by the twisted, enlarged and flattened middle tibia (fig. 12d) and by having the apical half of the middle femur covered with fine hairs on the dorsum, as well as by other details of the legs as shown in figure 12e.

A moderately large, conspicuous species. Antennae yellow, third segment almost two times longer than wide but rounded at apex. Thorax chiefly yellow with three rather indistinct brown vittae down the mesonotum; mesonotum brownish yellow pollinose. Some specimens have the mesonotum almost all brown to black. Pleura all yellow except for metapleura. Halteres yellow. Legs almost entirely yellow. Front femora without ventral bristles except for two or three weak posteroventrals near apex. Hind femora rather thickly covered with short black setae, these are especially noticeable on the anteroventral and posteroventral surfaces near the apex. Each middle femur with numerous rather long bristles extending from about basal sixth to apical fourth, these are arranged in several rows in the median portion; also with the dorsal half of the segment densely covered with moderately long, erect, black bristles. Middle tibia large and contorted, distinctly longer than the femur, enlarged and flattened at apex; with several rows of short, rather peglike, black bristles on anteroventral surface just before apex and with two strong preapical bristles on anterodorsal surface. Each middle basitarsus developed into a flat thumb-like lobe at apex on anteroventral portion and a strong black spine on anterodorsal surface (fig. 12d-e). The wings are rather faintly fumose. The fifth costal section is almost as wide as the fourth. The abdomen is very short and the genitalia inconspicuous; the abdomen is not as long as the thorax.

Length: body, 2.7 mm.; wings, 3.2 mm.

***Campsicnemus divergens* Van Duzee.**

Campsicnemus divergens Van Duzee, 1933, Proc. Haw. Ent. Soc. 8:333, fig. 92.

Endemic. Hawaii (type locality: Nauhi Gulch, 5,000–6,000 ft.). Type and cotype series in Hawaiian Sugar Planters' Association collection.

It is impossible to place this species. The type and all the cotypes are females. Van Duzee was in error in describing what he thought was a male specimen and there is no way to differentiate this from females of a number of species of *Campsicnemus* which are known to occur in the region around Mauna Kea at the 5,000 to 6,000 foot elevation.

***Campsicnemus dryoscartes* Hardy and Kohn, new species (fig. 12f–g).**

Fitting in the group of species which lacks ciliation on middle tarsi, which has the basitarsus simple and slender, the middle tibia without long ciliation and with a strong anterodorsal bristle on basal third, and the middle femur with strong ventral bristles. It differs from other species in this complex by having the front tarsi ciliated, by having a row of five anterior bristles at middle of segment on middle femur, and the ventral bristles of middle femur confined to the apical half (fig. 12f).

MALE. A small, dark-bodied species. *Head*: Eyes contiguous on the face for a

distance equal to four or five rows of eye facets. Upper and lower portions of face yellow-brown pubescent. Front and vertex shining black in ground color, rather densely gray pollinose. Antenna yellow, tinged with brown on third segment. Third segment rounded at apex, about as wide as long. *Thorax*: Yellow-brown, darker brown in median portion of mesonotum. Five pairs of dorsocentral bristles present. The first is small, poorly developed, the third pair is about the same size as the presuturals. Also one row of rather well-developed acrostichal setae present. *Legs*: Largely yellow, middle coxae and all of the tarsi brown, tibiae tinged with brown. Front femur lacking ventral bristles. Front tibia with a strong dorsal bristle just below middle. Front basitarsus two times longer than second segment and three-fifths as long as tibia. Tarsi with moderately long cilia along posteroventral surface, especially on the first three segments (fig. 12g). Middle femur moderately slender with a row of rather small posteroventral bristles; with a group of 8 to 12 anterior bristles arranged in two irregular rows at middle of segment; anterior ventral surface with two long bristles near base and with a row of short bristles extending from middle to apex. Middle tibia straight, posteroventral surface with a row of moderately developed erect bristles extending over basal two-thirds; one strong anterodorsal bristle situated at basal third of segment; also with a group of moderately developed suberect hairs (about five or six hairs) situated at about apical third of segment (fig. 12f). Middle basitarsus about half as long as tibia. Hind femur lacking ventral bristles. Anterodorsal surface of hind tibia with one bristle at basal one-fourth, one at apical third, and one at apex. Dorsal surface with one bristle at middle, one near apical third, and one just before the apex. *Wings*: Lightly fumose. Fourth and fifth costal sections about equal in length, and last section of M_{3+4} about three times longer than m crossvein. *Abdomen*: Dark brown, dusted lightly with gray. The genitalia have not been studied.

Length: body, 1.30 mm.; wings, 1.85 mm.

FEMALE. Unknown.

Holotype male: upper Olaa Forest, Hawaii, "Wet Tree Fern Jungle," August, 1956 (D. E. Hardy). Two male paratypes: one, Kaiholena Ridge, Kohala Mountains, Hawaii, 2,300 ft., August, 1952 (D. E. Hardy), and one, Glenwood, Hawaii, March, 1919 (O. H. Swezey).

Type in the B. P. Bishop Museum; paratypes in Hawaiian Sugar Planters' Association and University of Hawaii collections.

***Campsicnemus ephydrus* Hardy and Kohn, new species (fig. 13a-b).**

Fitting near *C. tibialis* Van Duzee in the group of species which has the middle basitarsus slender and which lacks long ciliation, and in which the eyes are rather widely separated on the face. It differs from *tibialis* by lacking the truncate posteroventral bristles on middle tibia as well as in other respects as pointed out in the key. It appears to be closely related to *C. labilis* n. sp. but differs by having only one dorsal bristle in middle of front tibia; the middle tibia with a

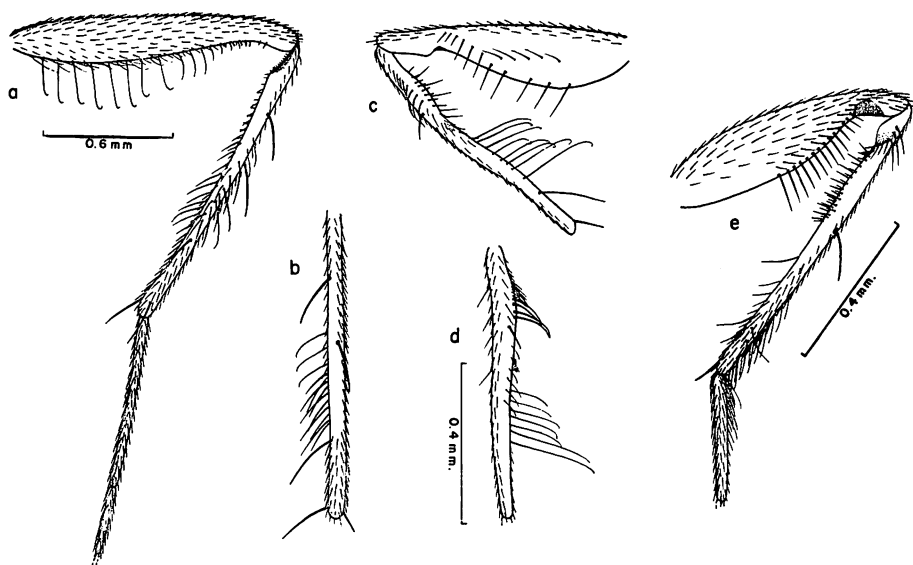


Figure 13—*Campsicnemus ephydrus* n. sp.: a, middle femur, tibia, and basal two tarsal segments, anterior view; b, middle tibia, dorsal view. *C. exiguus* n. sp.: c, middle femur and tibia, anterior view; d, middle tibia, dorsal view. *C. eximius* n. sp.: e, middle femur, tibia, and basitarsus, anterior view.

slight bump-like projection developed on anteroventral surface near base, and with a row of rather well-developed anterodorsal bristles; the middle femur with a row of rather well-developed anteroventral bristles extending the entire length, and just one anterior bristle present before apex of hind femur. It also shows relationship to *C. grimshawi* Van Duzee from Hawaii, but the development on the base of the middle tibia is not so pronounced, the middle tibia is straight, and the leg bristles differ.

MALE. *Head:* Face densely silvery pubescent, brownish yellow just below antennae; rather broad, at its widest point it is about equal in width to three or four rows of eye facets. Front and vertex metallic blue, rather thinly gray-brown pollinose. Antennae black, third segment obtuse, about as wide as long. *Thorax:* Mesonotum and scutellum black in ground color, rather densely gray-brown pollinose, faintly metallic blue in the median portion when viewed in direct light. Five pairs of well-developed dorsocentrals present and one row of strong acrostichals. Humeri brownish yellow. Upper half of each pleuron brown, tinged with yellow, lower portion yellow. Halteres yellow, tinged slightly with brown at the apices. *Legs:* Front coxae and all femora yellow, middle and hind femora narrowly brown at apices. Remainder of legs brown. Front femur with short erect setae along ventral surface. The longest of these is slightly less than half the width of the femur. The front tibia has a strong dorsal bristle just below the middle, it also has a strong posteroventral at basal third, another at apical third, and a strong posterior bristle just before the apex. Front basitarsus about two-

thirds as long as the tibia and two times longer than second tarsal segment. Middle femur with a row of rather well-developed anteroventral bristles extending the entire length of the segment. Those arranged near middle are about equal in length to the width of the segment. Middle tibia (fig. 13a) with 10 to 12 rather strong anterodorsal bristles arranged between basal third and apical one-fourth of segment; the strong dorsal bristle is situated at basal two-fifths of segment; the ventral surface has two rows of short peg-like bristles immediately behind the small bump on anteroventral surface. The ventral surface also has a continuous row of fine hair-like bristles extending the entire length of the segment, beyond the middle these are about half longer than the width of the tibia (fig. 13b); the posteroventral surface also has a row of rather well-developed erect bristles extending the entire length of the segment. The middle basitarsus is about three-fifths as long as the tibia and is nearly two times longer than the second tarsal segment. The hind femur has one strong anterior bristle before the apex but the ventral surface has only suberect setae. The dorsal surface of the hind tibia has five extra long bristles before the apex, one situated near basal fifth of segment and four arranged between basal third and apical third; anterodorsal surface with four bristles before apex, one near basal fifth and three arranged between the basal two-fifths and apical third; anteroventral surface with four bristles evenly spaced between basal third and apical fourth. *Wings*: Light brown fumose. Fourth costal section about two-thirds longer than fifth. Veins R_{4+5} and M_{1+2} slightly converging apically. Last section of M_{3+4} two and one-half times longer than m crossvein. *Abdomen*: Submetallic black in ground color, densely covered with brown pollen, about as long as the thorax.

Length: body, 3.0 mm.; wings, 3.7 mm.

FEMALE. Similar to the male except for secondary sexual characters. The dorsum of thorax and abdomen with a more distinct greenish sheen than in the male and the face about equal to five rows of eye facets at its narrowest point.

Length: body, 3.3 mm.; wings, 4.0 mm.

Holotype male and allotype female: Waikamoi, Maui, 4,000 ft., July, 1956 (collected skating on quiet pools along the Waikamoi Stream) (D. E. Hardy). Three male paratypes: same data as type (D. E. Hardy and R. Namba).

Type and allotype in the B. P. Bishop Museum. Paratypes in the following collections: U. S. National Museum, British Museum (Natural History), and the University of Hawaii.

***Campsicnemus exiguus* Hardy and Kohn, new species (fig. 13c-d).**

Fitting in the group with a slender basitarsus; lacking ciliation on the tarsi; a dorsal bristle on front tibia; truncate posteroventral bristles on middle tibia or with long ciliation on anterodorsal surface of middle tibia. It is related to *C. disjunctus* n. sp. but is differentiated by the more gently curved middle tibia, by lacking anterior bristles, and by the presence of long, hooked, anteroventral cilia in the median portion of the segment.

MALE. Small, chiefly yellow species. *Head*: Eyes separated on the face for a distance equal to about one row of eye facets. Face gray pubescent. Front and vertex blue-black in ground color, covered with gray pollen. Antennae yellow, third segment pointed, nearly two times longer than wide. *Thorax*: Mostly yellow, with a brown spot on metapleura and on sides of metanotum, and with the scutellum tinged with brown. Four pairs of distinct dorsocentral bristles and one pair of dorsocentral hairs present. One row of moderately developed acrostichals present extending two-thirds the length of the mesonotum. Front femur devoid of ventral bristles. Front tibia lacking a dorsal bristle. Middle femur moderately swollen basally, attenuated apically with a row of rather well-developed anteroventral bristles extending from about basal fourth to apical third of segment. Middle tibia slightly curved on basal half; anteroventral surface with one strong black bristle near apex and with eight long, pale, hooked cilia in a row between apical fourth and middle of segment (fig. 13c); posteroventral surface with four or five rather irregularly placed, widely spaced bristles on basal half; ventral surface also with several short bristles on about the basal third of the segment; dorsal surface with one moderately small bristle at basal third; anterodorsal and anterior surfaces with a clump made up of four moderately strong curved bristles and a group of small hairs situated at about basal fourth of segment (fig. 13d). Hind femur devoid of ventral bristles except for one or two at apex. Hind tibia without conspicuous dorsal bristles; the anterodorsal surface with one small bristle near basal two-fifths and another at apex; the dorsal surface with only a small preapical bristle visible. *Wings*: Almost hyaline. Fifth costal section about equal in length to the fourth. Last section of vein M_{3+4} two and one-half times longer than m crossvein. *Abdomen*: Dark brown to black covered with gray pollen.

Length: body, 1.15 mm.; wings, 1.60 mm.

FEMALE. Unknown.

Holotype male: Kula Pipeline, above Waikamoi, Maui, 4,200 ft., July, 1956 (D. E. Hardy).

Type in the B. P. Bishop Museum.

***Campsicnemus eximius* Hardy and Kohn, new species (fig. 13e).**

Fitting in the group of species which has the middle basitarsus slender and bearing fine ciliation on posterior margin and also with no blunt posteroventral bristles on middle tibia. It runs near *C. cracens* n. sp. and is differentiated by having a dorsal bristle on the middle tibia but lacking posterodorsal bristles, by the pointed third antennal segment, and by the different development of the middle tibia and tarsus (fig. 13e).

MALE. *Head*: Eyes closely joined on the middle of the face. Face entirely gray pubescent. Front shining black in ground color, covered with gray pollen. Antennae yellow, third segment tinged with brown on apical half, the latter cone shaped, almost two times longer than wide. *Thorax*: Entirely yellow, except for

a small black spot on metapleura. Five pairs of dorsocentrals are present but the first and fourth pairs are small, hair-like; one row of moderately developed acrostichals are present. *Legs*: Entirely yellow except for a slight brownish tinge on outside surface of middle coxa. Front femur devoid of ventral bristles. Front tibia with a small dorsal bristle just beyond middle. Middle femur thickened basally and attenuated apically, with a row of rather well-developed anteroventral bristles extending from about basal two-fifths to the attenuated portion near the apex of the segment. Middle tibia slender, slightly curved; posteroventral surface with a row of rather closely spaced pointed bristles extending from near base to about basal third of segment and with several irregularly spaced bristles on this surface extending to about apical third of segment; posterior surface with a row of short fine cilia extending over the apical half of the segment; anteroventral surface with a long hair-like bristle at apical fourth, this is equal to about two-fifths the length of the tibia. Also with several short erect bristles arranged on the apical third of this surface and a row of short erect bristles on basal third; a moderately strong dorsal bristle is situated at the basal two-fifths of the segment and a small clump of short black bristles are situated just below the base on the anterodorsal and anterior surfaces of the segment. The middle basitarsus is ciliated on the posterior margin for its entire length, it is about two-fifths as long as the tibia and nearly two times longer than the second tarsal segment. The hind femur lacks ventral bristles except for one or two at apex. The hind tibia has three dorsal and three anterodorsal bristles. *Wings*: Faintly fumose. The fifth costal section is slightly longer than the fourth. The last section of M_{3+4} is three times longer than m crossvein. *Abdomen*: Dark brown, covered with gray pollen.

Length: body, 1.10 mm.; wings, 1.85 mm.

FEMALE. Unknown.

Holotype male: Kula Pipeline, above Waikamoi, Maui, 4,200 ft., July, 1956 (R. Namba).

Type in the B. P. Bishop Museum.

***Campsicnemus ferrugineus* Parent.**

Campsicnemus ferrugineus Parent, 1934, Mem. Soc. Natl. Sci. Nat. Math. Cherbourg 41:298, pl. 77, fig. 3.

Endemic. Hawaii (type locality: "Hawaii, Sandwich Is., XI, 96").

Type in the British Museum (Natural History).

Based upon a single female and cannot be separated from the females of many species which fit the same general characteristics: *i.e.*, thorax and legs largely yellow, with a dark vitta down each dorsocentral row; antennae yellow, tinged with brown on third segment and third segment triangular, a little longer than wide. It is impossible to place this without the male.

Campsicnemus fimbriatus Grimshaw (fig. 14a-b).

Campsicnemus fimbriatus Grimshaw, 1901, Fauna Hawaiiensis 3:13, pl. 1, fig. 22.

Endemic. Hawaii (type locality: Kilauea, August, 1895). Known only from the type and allotype.

Type in the British Museum (Natural History). The following description is based upon the type and allotype. Both are in fair condition except that the head of the male is missing.

This fits in the group of species which lacks fine ciliation on the middle tarsi; which has the middle basitarsus simple and slender; the middle tibia straight, or nearly so and lacking blunt posteroventral bristles but having fine ciliation. It is related to *C. acuticornis* Parent but is distinguished by the curved middle femur with an anterodorsal brush of fine hairs at apex, by having the third antennal segment rounded at apex, and by having only four pairs of dorsocentral bristles on mesonotum.

MALE. *Thorax*: Predominantly yellow to rufous, slightly discolored with brown on the mesonotum, with a faint, greenish sheen on the hind third; scutellum entirely yellow. Metanotum yellow to rufous. Four pairs of dorsocentrals are present; the anterior pair is near the front margin of the thorax in line with the posthumeral bristle. There are no bristles situated between the anterior dorsocentrals and the posthumerals. The pleura and halteres are entirely reddish yellow. *Legs*: Yellow with slight discolorations of brown on the basal half of the front femur and also on the tarsus. Front tibia with a moderately strong dorsal bristle at basal third, a weak preapical dorsal, and a moderately developed preapical posterodorsal bristle. The middle femora are very noticeably contorted; they are rather strongly bowed on the anterior surface. The femur has a moderate posterior bristle at the apical one-fifth and a preapical brush of fine curved hairs located on the anterodorsal surface (fig. 14a). The middle tibiae are long and slender, are approximately one-third longer than the femora, and have three rather strong dorsal bristles, one of these is preapical; each has a series of long fine bristles or bristle-like hairs on the ventral surface, and the inner or anterior surface is densely covered with long, fine hairs (fig. 14a-b). The hind femur has a moderately strong preapical bristle on the anterior surface. The hind tibia has five dorsal bristles and three anterodorsals. It also has three small ventral bristles in addition to the two ventral spine-like bristles at the apex. *Wings*: Lightly gray fumose, the third costal section is over six times longer than the fourth: the proportions are 78 to 12. The fifth costal section is slightly shorter than the fourth: the proportions are 12 to 10. The last section of vein M_{1+2} is about one-half longer than the preceding section: the proportions are 75 to 48. The last section of vein M_{3+4} is about twice as long as the m crossvein: the proportions are 25 to 12. *Abdomen*: Dark brown to black in ground color, faintly metallic above. The sides of the first segment are rufous; the apices of the other terga are faintly grayish green pollinose with a slight greenish luster.

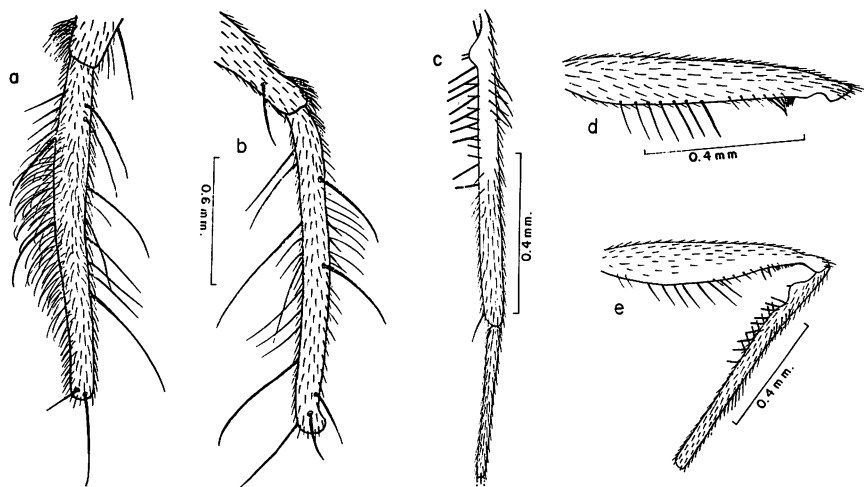


Figure 14—*Campsicnemus fimbriatus* Grimshaw: a, middle tibia, dorsal view; b, middle tibia, posterior view. *C. flavipes* n. sp.: c, middle tibia and basitarsus, anterior view; d, middle femur, anterior view. *C. flavithorax* n. sp.: e, middle femur and tibia, anterior view.

Length: body, without head: 2.55 mm.; wings, 2.80 mm.

FEMALE: The female specimen has the thorax predominantly brownish in ground color, the sternopleura, hypopleura, and the scutellum are yellowish to rufous, tinged slightly with brown; the mesonotum is grayish pollinose but has a more distinct greenish sheen over the entire portion. A bristle is present between the dorsocentral and the posthumeral and lies in front of the dorsocentral in line with the humeral bristle. The antennae are yellow. The middle tibia has one dorsal bristle at the basal third and another preapical; it also has four anterodorsal bristles counting the preapical, and two ventral bristles beside the two at the apex.

Length: body, 2.65 mm.; wings, 3.70 mm.

***Campsicnemus flavipes* Hardy and Kohn, new species (fig. 14c-d).**

Fitting in the group of species which lacks fine ciliation on middle tarsus, which has the middle basitarsus longer than second tarsal segment, the wings faintly fumose, and the middle tibia with a row of blunt posteroventral bristles on basal portion. It is closest related to *C. rhyphopus* n. sp. but is differentiated by the nearly straight middle tibia; by the blunt posteroventral bristles extending approximately to middle of segment; by having no long anterior bristles on median portion of tibia; by the middle femur being slightly constricted near apex with well-developed ventral bristles near the middle and with a short comb-like series near apical fourth (fig. 14d). It is also related to *C. miser* Parent (see discussion under that species).

MALE. A small predominantly yellow species. *Head*: Eyes contiguous on the front for a distance equal to the length of four or five rows of eye facets. Lower portion of face densely brownish yellow pubescent. Front and vertex metallic blue-green, rather lightly brownish gray pollinose. First two antennal segments yellow, third segment brownish yellow, subobtusate at apex just slightly longer than wide. *Thorax*: Yellow except for a brown spot on metapleura extending on to sides of metanotum and with faint indications of a brown vitta down each dorsocentral row. Four pairs of well-developed dorsocentrals and one row of acrostichals present. *Legs*: Almost entirely yellow. Front femur slender, lacking ventral bristles. Front basitarsus straight, nearly two times longer than second tarsal segment. Middle femur slender, ventral bristles as mentioned in the introduction above. Six moderately strong bristles are present in the median portion of the segment and the comb-like series at apex consists of 8 to 10 closely placed hair-like bristles (fig. 14d). Middle tibia slender, gently curved on basal third of segment; 11 or 12 truncate posteroventrals extend from middle of segment to the apex; also with a small rounded ridge developed on anteroventral margin at base of segment (fig. 14c). Middle basitarsus slender, about two times longer than second segment. Hind femur without distinct ventral bristles but with a row of suberect setae along anteroventral surface. *Wings*: Faintly fumose, almost hyaline. Fourth costal section just slightly longer than fifth. Last section of M_{3+4} two and one-half times longer than m crossvein. *Abdomen*: Chiefly brown on the dorsum, yellow on the venter, sides, and extreme bases of terga; not quite as long as the thorax. The genitalia have not been relaxed for study.

Length: body, 1.5 mm.; wings, 2.0 mm.

FEMALE. Unknown.

Holotype male and two male paratypes: Pauahi, Hawaii, 4,300 ft., August, 1952 (D. E. Hardy and W. C. Mitchell).

Type in the B. P. Bishop Museum. Paratypes in the U.S. National Museum and the University of Hawaii.

***Campsicnemus flavithorax* Hardy and Kohn, new species (fig. 14e).**

Fitting in the group of species which has the middle tibia slender, not swollen or sinuate, and with a projection near base of segment. Related to *C. grimshawi* Van Duzee but differentiated by the yellow thorax, by the constriction at apex of middle femur, and by having both the middle femur and tibia with strong ventral bristles (fig. 14e).

MALE. *Head*: Two basal segments of antennae yellow, third segment yellow-brown, about two-thirds longer than wide, rather sharply pointed at apex. Eyes contiguous on the front for a distance about equal to the length of three rows of eye facets. Lower portion of face yellow pubescent, upper portion dark gray. Front and vertex metallic green to coppery, rather lightly yellow-brown pollinose. *Thorax*: Entirely yellow except for a dark brown to black spot on metapleura, a slight discoloration of brown on each side of metanotum and a faint indication

of a brown vitta down each dorsocentral row. Four pairs of dorsocentral bristles and one row of acrostichal setae present. *Legs*: Entirely yellow except for a brown discoloration on outside surface of middle coxa and for the brown tarsi. Front femur slender with one moderately developed posteroventral bristle just before the apex. Middle femur moderately slender with a strong constriction just before the apex; posteroventral surface with about seven rather strong black bristles arranged from basal one-fourth to about apical two-fifths, and with a series of about 10 short closely placed bristles situated just before the constriction; anteroventral surface with a series of short, inconspicuous hair-like bristles on about apical third of segment. Middle tibia slender, almost straight, with a row of moderately strong, blunt posteroventral bristles extending over the basal half (fig. 14e). Middle basitarsus rather long and slender, equal in length to the next two tarsal segments and slightly more than half as long as the tibia. Hind legs not ornate or with distinctive bristles. *Wings*: Almost hyaline. Fourth costal section one-half longer than fifth. Last section of M_{3+4} almost three times longer than m crossvein. *Abdomen*: Largely yellow. Apices of terga brown.

Length: body, 1.7 mm.; wings, 2.1 mm.

FEMALE. Fitting the description of the male except for the lack of ornamentation on the legs. The face is about two eye facets wide and the abdomen is darker brown.

Holotype male: Upper Olaa Forest, Hawaii, August, 1952 (W. C. Mitchell). Allotype female: Pepeekeo Forest Reserve, Hawaii, May, 1944 (N.L.H. Krauss). One paratype male: same data as allotype.

Type and allotype in the B. P. Bishop Museum. Paratype in the University of Hawaii collection.

***Campsicnemus flaviventer* Hardy and Kohn, new species (fig. 15a).**

Fitting in the group of species which lacks ciliation on middle tarsus, which has the middle basitarsus simple and slender, and the middle tibia straight, bearing no blunt posteroventral bristles or long ciliation. It is related to *C. diamphidius* n. sp., from Maui, but is differentiated by the more completely yellow thorax, by having the venter and sides of abdomen yellow, by the eyes being nearly contiguous on the face, and the middle basitarsus about two-fifths as long as the tibia (fig. 15a).

MALE. A large, conspicuously marked species. *Head*: Eyes contiguous on the face or nearly so for a distance equal to about four or five rows of eye facets. Face densely brownish yellow pubescent. Mouthparts dark brown to black, tinged with yellow to rufous. Front, vertex, and occiput subopaque black in ground color, rather densely brownish gray pollinose. *Thorax*: Largely yellow; metapleura, metanotum, scutellum, and a broad vitta down each dorsocentral row, brown. Five pairs of dorsocentral bristles and one row of well-developed acrostichal setae present. Pronotum conspicuous with five or six strong bristles on each side. Halteres yellow. *Legs*: Middle coxae and all tibiae and tarsi dark

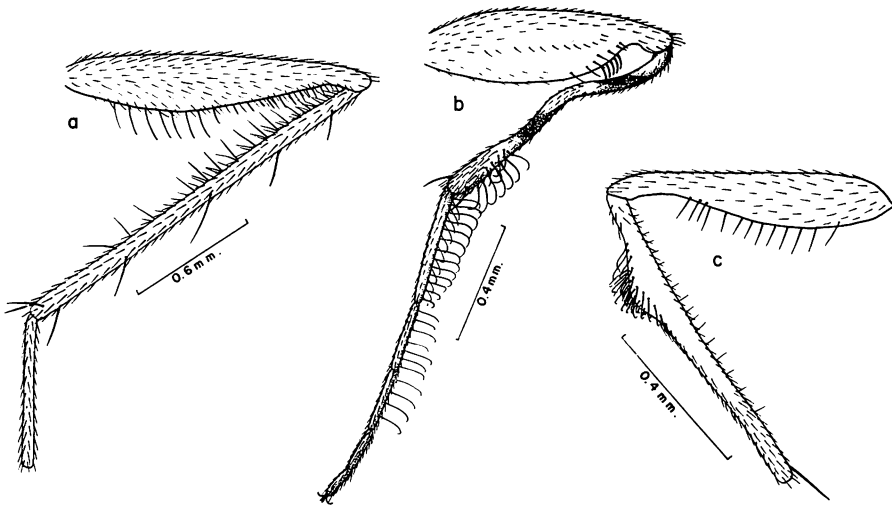


Figure 15—*Campsicnemus flaviventer* n. sp.: a, middle femur, tibia, and basitarsus, anterior view. *C. flexuosus* Parent: b, middle leg, anterior view. *C. fragilis* Parent: c, middle femur and tibia, anterior view.

brown to black; the hind coxae are yellow-brown; the legs are otherwise yellow. Front coxa rather thickly covered with short, suberect, brown, setae over dorsal surface and with moderately strong bristles at apex. Front femur devoid of ventral bristles. Anterodorsal bristle of front tibia strong and situated at the basal two-fifths of the segment. Front basitarsus long and slender, about four-fifths as long as the tibia. Middle femur moderately slender, with a row of rather strong, black, hair-like anteroventrals extending the entire length of the segment and with shorter, thicker, posteroventrals extending from about basal two-fifths to apical one-fourth of segment. Middle tibia straight and slender, posteroventral surface with a row of moderately developed, erect bristles extending from about basal one-sixth to apical two-fifths of segment, and with two suberect bristles situated at apical fourth; four anterodorsals present, one near basal fourth, one near basal two-fifths, one at apical third, and one preapical; also one dorsal bristle situated at basal third of segment (fig. 15a). Middle basitarsus two times longer than second segment and about two-fifths as long as tibia. Hind femur lacking ventral bristles except at extreme apex. Hind tibia with four anterodorsal bristles and five posterodorsals. Hind basitarsus one-third as long as tibia. *Wings*: Light brown fumose, with darker infuscation over the m crossvein and in apical and anterior portions of wings. (Note: specimens from the Island of Hawaii lack the distinct fuscous markings on the wings, just slight infuscation is present over the m crossvein.) Vein R_{4+5} slightly convex so the apical portion of cell R_5 is narrower than the median part. The fourth costal section is almost two times longer than fifth. The last section of

M_{3+4} is about two times longer than the m crossvein. *Abdomen*: Yellow on the venter, on the basal portion of the first tergum, and on lateral margins of other terga; otherwise dark brown. Genitalia yellow, tinged lightly with brown.

Length: body, 3.0–3.4 mm.; wings, 3.8–4.0 mm.

FEMALE. Fitting the description of the male in most respects. The wing infuscations are darker brown; the legs are predominantly brown, only the trochanters and extreme apices and bases of femora are yellow; also the mesonotum is predominantly brown, with only the sides and a narrow stripe down the middle yellow to brownish yellow. The eyes are rather closely joined on the face and separated by about one-half the width of the eye facets. The third antennal segment is rounded, as wide as long. The middle legs also lack the ventral bristles which are distinctive of the males.

Holotype male: Manawainui Valley, Molokai, August, 1953 (D. E. Hardy). Allotype female: same locality as type, July, 1952 (D. E. Hardy). Twenty-one paratypes, 11 males and 10 females, from the following localities: 8, same as type and allotype; 1, Puu Kolekole, July, 1953 (M. Tamashiro); 2, Pauahi, Kona Coast, Hawaii, 4,300 ft., July, 1952 (W. C. Mitchell and D. E. Hardy); 5, Upper Olaa Forest, Hawaii, August, 1953 (W. C. Mitchell and D. E. Hardy); 1, Kaihoolena, Kohala Mts., 4,000 ft., August, 1952 (D. E. Hardy); 1, near Pawaina, Kona, Hawaii, 3,000 ft., July, 1953 (D. E. Hardy); 1, Mauna Loa Truck Trail, Hawaii, 4,000 ft., July, 1952 (D. E. Hardy); 1, Kaluakauka, Hawaii, 6,500 ft., October, 1952 (D. E. Hardy); and 1, Keauhou Ranch, Kilauea, Hawaii, July, 1953 (D. E. Hardy).

Type, allotype, and a series of paratypes in the B. P. Bishop Museum. Remainder of the paratypes distributed among the following collections: U. S. National Museum, British Museum (Natural History), Hawaiian Sugar Planters' Association, State Department of Agriculture, and the University of Hawaii.

***Campsicnemus flexuosus* Parent (fig. 15b).**

Campsicnemus flexuosus Parent, 1938, Proc. Haw. Ent. Soc. 10:226, fig. 5.

Endemic. Oahu (type locality: Lulumahu Stream, 1,900 ft.). Known from both the Koolau and Waianae Mountains.

Type in British Museum (Natural History). A cotype from Konahuanui Trail, Oahu, is in the Parent collection at the Museum National d'Histoire Naturelle, Paris. Five topotypic specimens are in the Hawaiian Sugar Planters' Association collection.

Fitting in the group of species with the middle basitarsus lacking an apical spur and longer than second tarsal segment and with the three basal tarsal segments ciliated. It differs from other species in this complex by the sinuate middle tibia, the strongly thickened middle femur, the different bristling of the legs (fig. 15b), and by having only three pairs of dorsocentral bristles.

Predominantly yellow species. Third antennal segment rather sharp pointed, two-thirds longer than wide. Middle femur moderately swollen, with five or six

rather strong posteroventral and about six small anteroventral bristles situated at apical one-fifth of segment. Middle tibia rather strongly sinuate, posteroventral surface with six or seven truncate bristles on basal third, two of which are short and situated at basal one-sixth of segment, four to five bristles are moderately developed and located at basal third; anterodorsal surface of tibia with a rather dense clump of yellow-brown apically curved cilia near apex of segment. Middle tarsi ciliated on anterior surface of basal three segments, the cilia greater in length than the width of the segment, and curved at apices. The thorax is largely yellow, tinged with brown on the mesonotum and with a distinct brown vitta down each dorsocentral row.

Length: body, 1.7–2.0 mm.; wings, 2.3–2.5 mm.

***Campsicnemus fragilis* Parent (fig. 15c).**

Campsicnemus fragilis Parent, 1939, Proc. Haw. Ent. Soc. 10:227, fig. 6.

Endemic. Oahu (type locality: Olympus, 2,300–2,400 ft.). Known only from Mt. Olympus, Koolau Mountains.

Type in the British Museum (Natural History). One male and one female in the Parent collection, Museum National d'Histoire Naturelle, Paris, labeled "cotypes"; also two topotypic specimens are in the collection, not labeled. One topotypic specimen is in Hawaiian Sugar Planters' Association collection, "Olympus 2,300 ft., August 23, 1936 (F. X. Williams)."

Fitting in the group of species which lacks fine ciliation on middle tarsus and with the middle basitarsus simple and longer than second tarsal segment. It is related to *C. fusticulus* n. sp. by having the bristles or long hairs of middle tibia restricted to a cluster on the swollen basal third of segment. It is differentiated by its predominantly yellow body; by the middle femur lacking posterior bristles on apical fourth, and by the fine hair-like setae present on the swelling of the middle tibia (fig. 15c).

Almost entirely yellow species, discolored with brown on mesonotum and dorsum of abdomen. Middle femur moderately swollen and rather strongly attenuated apically, with about 12 posteroventral bristles extending from about basal one-fifth to apical one-fourth. Middle tibia straight, as seen in dorsal view, and with a rather strong swelling at basal third, this rather densely covered with fine hairs, especially on the posterodorsal surface (fig. 15c). Middle tarsus not ciliated, basitarsus two-thirds longer than second segment.

Length: body, 1.75 mm.; wings, 2.25 mm.

***Campsicnemus fulvifacies* Hardy and Kohn, new species (fig. 16a–b).**

Fitting in the group of species with the middle tarsi having cilia on the first three segments and the basitarsus simple and slender; the middle tibia curved near base and with a row of blunt posteroventral bristles; also the middle femur with ventral bristles only on apical two-fifths. It is related to *C. brunnescens* n. sp.,

but the anterior bristle of the middle tibia is small and is situated at the middle of the segment. Also the middle basitarsus is one-half as long as the tibia (fig. 16a).

MALE. *Head:* Eyes contiguous or nearly so for a distance of two or three rows of eye facets. Face brownish yellow pubescent. Front and vertex metallic green to blue-green in ground color, rather densely brownish gray pollinose. Basal segments of antennae yellow, tinged with brown. Third segment brown, rather sharp pointed, two times longer than wide. *Thorax:* Mesonotum and scutellum dark brown to black in ground color, rather densely brown pollinose but with a distinct metallic sheen through the median portion as seen in direct light. Upper portions of pleura brown, lower portions yellow. Five pairs of dorsocentral bristles are present, the first pair weak; also a row of distinct acrostichal setae is developed down the front half of mesonotum. Halteres clear yellow. *Legs:* Predominantly yellow. Front and hind femora without distinct ventral bristles except at apices. Middle femur moderately swollen, strongly attenuated at apex and with eight or nine rather strong black ventral bristles at apical third of segment. Middle tibia slender, rather strongly curved at basal third, with a row of blunt posteroventral bristles extending over basal third of segment (fig. 16b); anterodorsal surface with about six erect bristles at apical third; and anterior bristle situated near middle of segment. First three tarsal segments of middle legs with ciliation along anterior surface, and basitarsus ciliated along anterodorsal surface. Middle basitarsus about one-half as long as tibia (fig. 16a). *Wings:* Faintly fumose. Fourth costal section about equal in length to fifth. Last section of M_{3+4} two and one-half times longer than m crossvein. *Abdomen:* Entirely black. The genitalia have not been relaxed for study.

Length: body, 1.7 mm.; wings, 2.3 mm.

FEMALE. Unknown.

Holotype male: Puu Kolehale, Molokai, July, 1952 (D. E. Hardy). One paratype male: Hanaliolilo, Molokai, July, 1952 (M. Tamashiro).

Type in the B. P. Bishop Museum. Paratype in the University of Hawaii collection.

***Campsicnemus fumipennis* Parent (fig. 16c-d).**

Campsicnemus fumipennis Parent, 1938, Konowia 16:76, fig. 10.

Endemic. Molokai (type locality: near Moaula—misspelled “Moalua” in the original and on the type). Described from female. The same species also apparently occurs in the Koolau Mountains of Oahu; Williams collected a good series of these from Lulumahu Valley, Konahuanui, and Kaluanui Valley, on Oahu; these were collected mostly on banana stems. Williams (1938:120-126) has written a very excellent account of the life history and habits of this species. He says it is predominantly arboreal in the adult stages and particularly favors the stems of bananas.

Type in the Hawaiian Sugar Planters' Association collection.

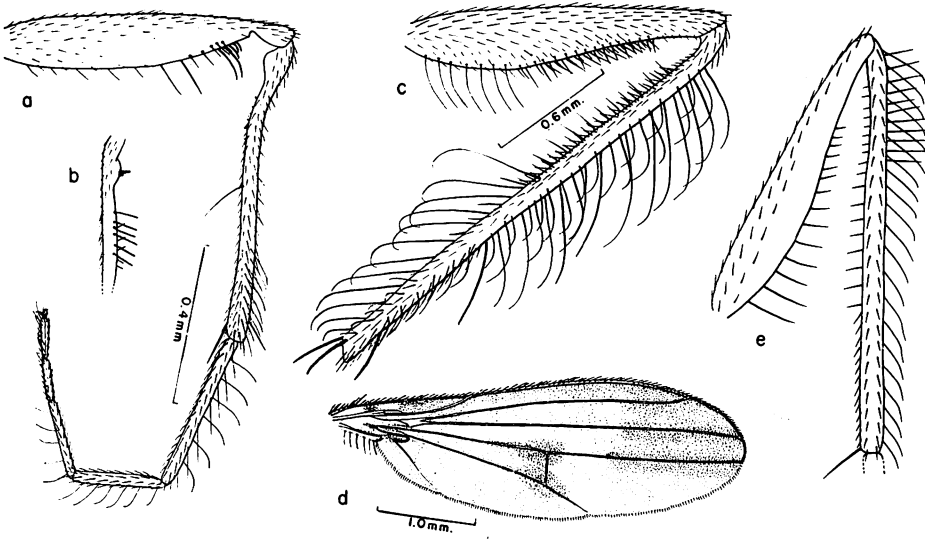


Figure 16—*Campsicnemus fulvifacies* n. sp.: a, middle leg, anterior view; b, base of middle tibia, ventral view. *C. fumipennis* Parent: c, middle femur and tibia, anterior view; d, wing. *C. furax* Parent: e, middle femur and tibia, copied from Parent (1939).

Fitting in the group of species which lacks a projection on middle tibia, which has the middle tarsi ciliated and the basitarsus slender, and which has five pairs of dorsocentral bristles. It runs close to *C. ciliatus* Van Duzee, but is not related to that species. It differs strikingly by being much larger; by having fumose markings on the wings, and by the middle tibia being straight, not swollen; it is covered with long ciliation on both the dorsal and ventral surfaces (fig. 16c).

The male of this species has not been seen from Molokai but female specimens from Oahu seem to fit the type in all details, and the species is probably correctly placed.

MALE. A large, conspicuous, highly ornate species. The eyes are closely joined but not quite contiguous on the middle of the face. The face is densely gray pubescent. The antennae are yellow; the third segment is long-pointed, about two times longer than wide. Pronotum plainly visible and possessing a row of five strong bristles on each side. Thorax predominantly yellow with a brown spot on each metapleuron, extending on to sides of metanotum and with a broad brown vitta down each dorsocentral row. Scutellum brown. One row of well-developed acrostichal setae present. Front femur without ventral bristles, front basitarsus slender, about two-thirds as long as tibia. Middle femur slender with several rows of rather long hair-like bristles extending almost the entire length of the segment. These are more abundant and slightly thicker on the apical half. Middle tibia slender and straight, with a row of long, curved anterodorsal bristles extending the entire length of the segment, and with a row

of long, curved posterodorsals extending over the apical half of the segment; also with a row of short, straight, posteroventrals extending over the basal half (fig. 16c). Middle basitarsus about one-third as long as tibia and about one-third longer than second segment. Hind femur with a row of erect yellow-brown hairs down ventral surface but no distinct bristles. Hind tibia long and slender with four anterodorsal bristles and five dorsal bristles. Hind basitarsus one-third as long as tibia. Middle tarsus with rather long ciliation along anterior surface of all of the segments. Wings distinctly fumose, darker infuscated along the m crossvein. The fourth costal section is about two times longer than the fifth. Cell R_5 is very slightly narrowed at apex. Last section of M_{3+4} less than one-half longer than m crossvein (fig. 16d). In this regard the wing somewhat approaches that of the genus *Eurynogaster*. Abdomen predominantly dark brown to black with a bright yellow spot on sides of the terga.

Length: body, 3.00–3.35 mm.; wings, 4.00 mm.

***Campsicnemus furax* Parent (fig. 16e).**

Campsicnemus furax Parent, 1939, Proc. Haw. Ent. Soc. 10:228, fig. 8.

Endemic. Oahu (type locality: Mt. Kaala, 3,600 ft.). Known only from the type.

Type in the British Museum (Natural History).

Fitting in the group of species which has the middle tarsus without ciliation and the middle basitarsus simple and slender and which has no dorsal bristles on front tibia or before the apex of the middle tibia. It differs from other species in this complex by having the front shining metallic green and by the presence of a row of posterodorsal hairs on basal third of middle tibia.

The following notes are from the original description: Front brilliant metallic green. Lower portion of face yellow. Eyes contiguous on face. Antenna yellow-red, third segment brown on margin, about as wide as long. Thorax largely yellow-red, slightly metallic, covered with yellow-gray pollen on mesonotum and with a brown vitta down each dorsocentral row. Four pairs of dorsocentral bristles present. Middle femur slender, ventral bristles extending from near base to about apical third. Those on basal half are the longest. Middle tibia with a row of short posteroventral bristles extending over basal three-fifths, a row of moderately long anterodorsals extending the entire length of the segment, also the posterior (probably posterodorsal) surface has a row of rather long cilia on basal third (fig. 16e; taken from Parent).

Length: 2.0 mm.

***Campsicnemus fusticulus* Hardy and Kohn, new species (fig. 17a).**

Fitting in the group of species which lacks ciliation on middle tarsi and with the middle basitarsus simple and longer than second tarsal segment. It is related to *C. fragilis* Parent by having the bristles of the middle tibia restricted

to the basal third of the segment and with a swelling at the basal third (fig. 17a). It differs from *fragilis* by having the body dark brown, by the swollen portion of the middle tibia being strongly bristled, and the middle femur having posterior bristles on apical third.

MALE. Small, black-bodied species. *Head:* Eyes contiguous on the face for a distance equal to about six rows of eye facets. Antenna mostly yellow; third segment tinged with brown, subacute at apex, about one-third longer than wide. *Thorax:* Brownish gray pollinose. Four pairs of well-developed dorsocentrals and no acrostichals present. Halteres clear yellow. *Legs:* Mostly yellow, middle coxa brown. Each hind femur with a rather broad brown band just before apex. Middle femur moderately swollen with five or six posteroventral bristles arranged from about the middle to near the base of the segment, apical portion of middle femur flattened dorsoventrally and slightly extended on anterior surface. Middle tibia slender, straight, with a rather strong swelling on anterior surface at basal third. This swollen portion is densely covered with short thick bristles (fig. 17a). Middle basitarsus slender, about two-thirds longer than second segment and about half as long as tibia. Hind femur with a row of short, black, suberect setae extending the entire length of the segment along the anteroventral surface. *Wings:* Faintly fumose. Fourth costal section about one-third longer than fifth. Last section of M_{3+4} three times longer than m crossvein. *Abdomen:* Entirely black, about equal in length to the thorax. The genitalia have not been relaxed for study.

Length: body, 1.65 mm.; wings, 2.20 mm.

FEMALE. Similar to the male except that the legs are not ornate. The hind femur lacks the brown band before the apex. The face is about two facets wide at its narrowest point. The third antennal segment is more rounded at apex, and well-developed acrostichal setae are present.

Holotype male and allotype female: North slope, Hualalai, Hawaii, 4,000–6,000 ft., July, 1953 (D. E. Hardy). Ten paratypes (nine males, one female) from the following localities: eight specimens same data as type; one specimen each from Kilauea, Hawaii, Kipuka Ki, 4,250 ft., on forest floor, January 31, 1945 (F. X. Williams); Kilauea, Hawaii, Kipuka Nene, 3,000 ft., January 31, 1945 (F. X. Williams), on ground.

Type and allotype in the B. P. Bishop Museum. Paratypes in the following collections: U. S. National Museum, British Museum (Natural History), Hawaiian Sugar Planters' Association, and the University of Hawaii.

***Campsicnemus gloriosus* Van Duzee (fig. 17b–d).**

Campsicnemus gloriosus Van Duzee, 1933, Proc. Haw. Ent. Soc. 8:318, figs. 22–29.

Campsicnemus concavus Van Duzee, 1933, Proc. Haw. Ent. Soc. 8:316, figs. 16, 17. **New synonymy.** The type (Hawaiian Sugar Planters' Association col-

lection) is a female specimen, not a male. It is obviously the female of *gloriosus* Van Duzee.

Endemic. Oahu (type locality: Pauoa headwaters, Tantalus, 1,400 ft.). Found in both the Waianae (Mt. Kaala, 4,000 ft.) and Koolau Mountains; also on Lanai (Lanaihale, 3,200 ft.) and Molokai (Manawainui Valley). A water skater, on small pools in the mountains.

Type in the Hawaiian Sugar Planters' Association collection.

Characterized by having the middle tarsus inserted before the apex of tibia and the apex of the middle tibia bearing very long curved bristles (fig. 17b).

Predominantly dark-colored species, only the lower portion of the pleura, the coxae, and femora yellow. The third antennal segment is cone-shaped, rather elongated and attenuated to a sharp point (fig. 17d). The mesonotum and scutellum are shining black covered with gray pollen. The halteres are yellow with brown knobs. Each middle tibia is long and slender, arcuate on the anterior margin, two and one-half times longer than the basitarsus, with a rather large yellow basal lobe on anterior surface (fig. 17c) and the apex developed as in figure 17b. Both the hind and the front femora have 7 to 10 black bristles rather evenly distributed on the ventral surfaces.

Length: body, 1.7–2.0 mm.; wings, 2.4 mm.

Van Duzee's original description is adequate.

***Campsicnemus goniochaeta* Hardy and Kohn, new species (fig. 17e).**

Closely related to *C. penicillatus* Parent, but the chaetotaxy of the middle tibia is very different, as shown in figure 17e; only one small clump of hairlike bristles is situated on the dorsal surface of the tibia rather than three large clumps; the dorsal surface is predominantly bare.

MALE. *Head*: Eyes contiguous or nearly so for about half the length of the face. Lower portion of face densely yellow-brown pubescent. Antennae yellow, tinged with brown, third segment as wide as long, rounded at apex; arista sub-basal. Front and vertex dull black, faintly shining. *Thorax*: Chiefly black, lower portions of pleura and sternum yellow. Halteres yellow. Four pairs of dorsocentrals and one row of acrostichals present. *Legs*: Predominantly yellow, midcoxae and all tarsi tinged with brown. Each front femur moderately swollen, with a dense clump of strong, flat ventral bristles at base. Middle femora devoid of ventral bristles. Each middle tibia flattened on dorsal surface, somewhat curved, with a small clump of bristles at basal third, a strongly bent posterodorsal bristle at apical two-fifths, and with two or three long, fine bristles directly behind the strongly bent bristle. Midfemur also with a row of moderately strong, erect, anterior bristles and a row of posterior bristles extending most of the length of the segment. Midbasitarsus with a strong flat, blunt spur at apex (fig. 17e); the

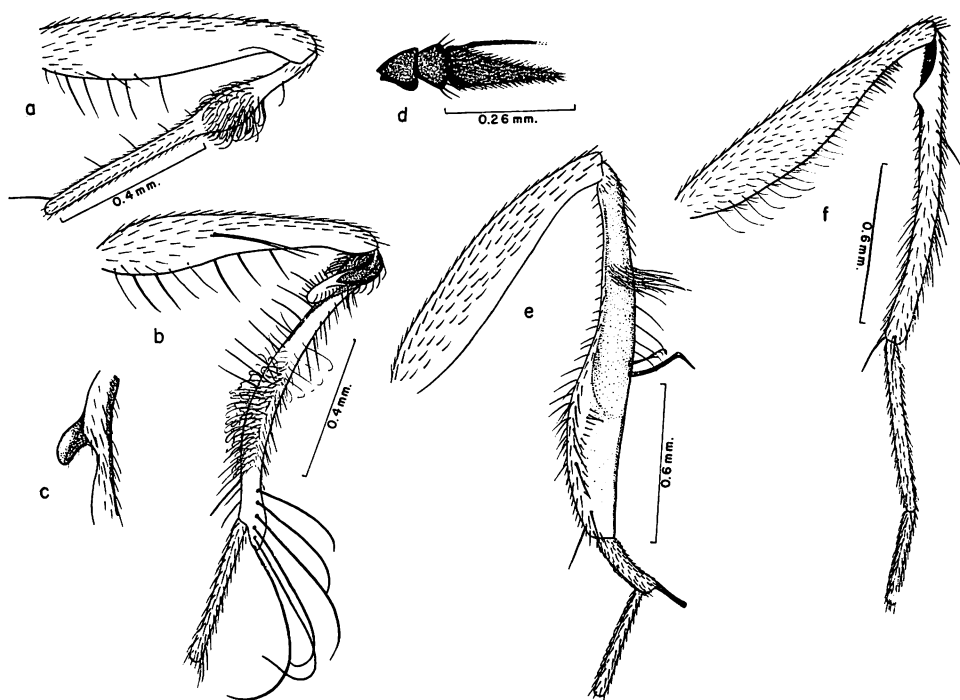


Figure 17—*Campsincnemus fusticulus* n. sp.: a, middle femur and tibia, anterior view. *C. gloriosus* Van Duzee: b, middle femur, tibia, and basitarsus, anterior view; c, basal knob of tibia, dorsal view; d, antenna, *C. goniochaeta* n. sp.: e, middle femur, tibia and basal two tarsal segments, anterior view. *C. grimshawi* Van Duzee: f, middle femur, tibia, and basal two tarsal segments, anterior view.

basitarsus is about two-thirds as long as the second segment. Hind legs without unusual bristles, each femur with a row of moderate-sized anteroventral bristles at apical third; also with a row of rather small ventral bristles at basal third. *Wings*: Faintly brown fumose. Fourth costal section one-half longer than fifth. Last section of M_{3+4} about two and one-half times longer than m crossvein. *Abdomen*: Black, densely brown pollinose, faintly metallic; about equal in length to head and thorax combined.

Length: body, 2.70 mm.; wings, 3.15 mm.

FEMALE. Unknown.

Holotype male: north slopes Hualalai, Hawaii, 4,000–6,000 ft., July, 1953 (D. E. Hardy); four male paratypes: one, same data as type; one, Kahuku Ranch, Hawaii, 3,000 ft., July, 1953 (D. E. Hardy); and two, Pauahi, Hawaii, 4,300 ft., August, 1952 and 1956 (W. C. Mitchell and D. E. Hardy).

Type in the B. P. Bishop Museum. Paratypes in the following collections: U. S. National Museum, British Museum (Natural History), and the University of Hawaii.

***Campsicnemus grimshawi* Van Duzee (fig. 17f).**

Campsicnemus grimshawi Van Duzee, 1933, Proc. Haw. Ent. Soc. 8:319, figs. 30-32.

Endemic. Hawaii (type locality: Nauhi Gulch, 5,000 ft., "on a forest pool").

Type in the Hawaiian Sugar Planters' Association collection.

Fitting in the group of species which has a projection at base of middle tibia and the middle tibia slender, not swollen or sinuate. It is closely related to *C. flavithorax* n. sp., from Hawaii, but differs by having the thorax dark brown, the middle femora not constricted apically and without strong ventral bristles; also by lacking ventral bristles on middle tibiae.

Body predominantly dark colored, only the lower portion of the pleura yellow; mesonotum polished black in ground color, rather densely covered with gray pollen. Scutellum metallic blue, rather thinly brown pollinose. Halteres yellow, tinged with brown. Third antennal segment comparatively short, only about one-half longer than wide. The original description says the eyes are "broadly contiguous" (they are actually separated on the face by about two and a half eye facets). Front coxae and all femora yellow, legs otherwise yellow-brown to black. Anteroventral surface of each front femur with a row of about nine short black bristles at apical third, followed basally by a row of rather long, thin, pale hairs which extend almost to the base of the segment. The middle tibia is as in figure 17f, the basal projection is rather triangular, and the segment not quite two times longer than basitarsus.

Van Duzee's description is adequate.

Length: body, 2.2-2.4 mm.; wings, 2.8-3.3 mm.

***Campsicnemus haleakalae* (Zimmerman), new combination (fig. 18a-b).**

Emperotera haleakalae Zimmerman, 1938, Proc. Haw. Ent. Soc. 10:146, fig. 1a-d.

Endemic. Maui (type locality: northwest slope of Mt. Haleakala, 6,000-6,500 ft., on "the slope to the northeast of Puu Nianiau above Olinda." "The individuals of this species range over the moss and lichen covered trunks and branches of living and dead trees, on fallen logs and on the ground in the damp forest. They are active and will jump one and one half to two inches at the slightest provocation. Their small size and cryptic coloration makes them difficult to find. . . . They were collected by beating moss and lichen covered limbs or trunks, by tearing off moss and lichens and shaking the material into a beating net and by throwing ground litter on a piece of white sheeting and watching carefully until they began to hop or run about."—Zimmerman, 1938:148).

Type in the B. P. Bishop Museum.

This belongs in the group which has aborted wings, but it obviously is not related to any of the other known species which exhibit this characteristic. It would fit closest to *mirabilis* (Grimshaw) because of the structure of the legs.

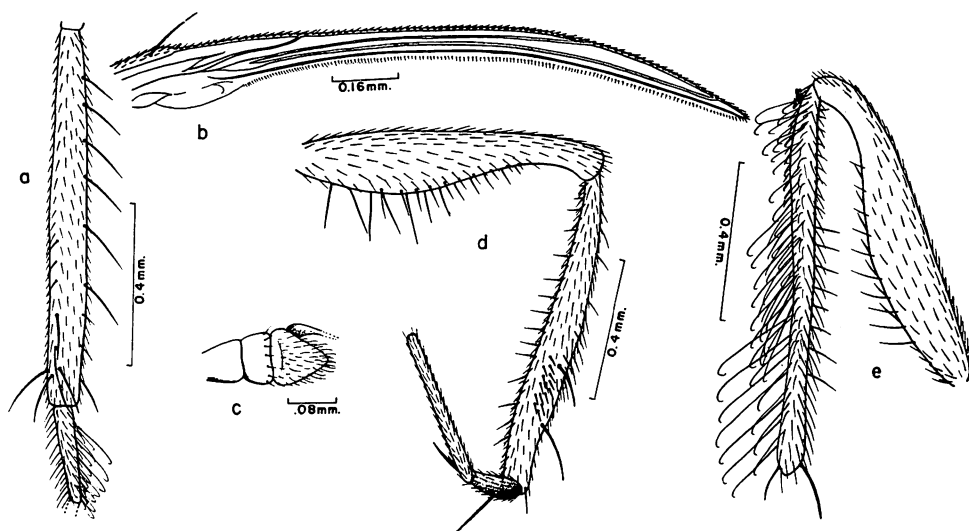


Figure 18—*Campsicnemus haleakalae* (Zimmerman): a, middle tibia and basitarsus, dorsal view; b, wing. *C. helvolus* n. sp.: c, antenna; d, middle femur, tibia, and basal two tarsal segments, anterior view. *C. hispidipes* n. sp.: e, middle femur and tibia, anterior view.

However, it is quite distinctly different from this species. The wings lack the apical bristle which is characteristic of *mirabilis*, they are not so narrow, and have three longitudinal veins developed rather than just one. Also each middle tibia has seven long posterodorsal bristles rather than just four, and the mesonotum is bronzy brown rather than polished black.

This is easily recognized and cannot be confused with any other known species. The original description is complete and the important structural details are as in figure 18a–b.

Length: body, 1.5 mm.

***Campsicnemus helvolus* Hardy and Kohn, new species (fig. 18c–d).**

Fitting in the group of species with short middle basitarsus terminating in a large apical spur; with four pairs of dorsocentral bristles; middle tibia not flattened or curved; and middle femur with numerous long ventral bristles. It differs from other species in this complex by having the middle basitarsus about one-fourth as long as the second tarsal segment with the spur about equal in length to basitarsus (fig. 18d), by the middle tibia having a patch of small black bristles on anterior surface at apical third, and by the middle femur lacking long pale bristly hairs on anterodorsal surface.

MALE. A moderately small, almost entirely yellow species. **Head:** Antennae yellow. Third segment rounded at apex and about as wide as long (fig. 18c). Eyes narrowly separated in middle of face, at its narrowest point the face is less

than half as wide as one eye facet, entire face densely gray pubescent. Mouth-parts yellow. Front and vertex metallic black in ground color, rather densely gray pollinose. *Thorax*: Entirely yellow except for a dark brown spot on metapleura, extending on to sides of metanotum, also a brown spot immediately behind wing bases, a brown spot in median hind portion of mesonotum, and a faint brown vitta extending down each dorsocentral row. Four pairs of dorsocentrals and one row of acrostichals present. *Legs*: All yellow except for a faint brownish tinge on middle coxa and on apical segment of tarsi. Front and hind legs without distinctive bristles or hairs. Middle femur moderately swollen, with a row of rather strong posteroventral bristles extending from basal fourth to apical fourth of segment; anteroventral surface with smaller bristles extending from about basal two-fifths to apical fourth. Middle tibia straight, only slightly thickened; with two rather strong anterodorsal bristles at apical third and apical one-sixth of segment, respectively; the short, black anterior bristles at apical third extend onto the anterodorsal surface (fig. 18d). The spur at apex of basitarsus is just slightly curved and is about one-fourth as long as second tarsal segment. *Wings*: Hyaline or nearly so. Fourth costal section one-third to one-half longer than fifth. Last section of M_{3+4} three times longer than m crossvein. *Abdomen*: Predominantly yellow, tinged with brown on the dorsum, rather short, about equal in length to the thorax. The genitalia have not been relaxed for study.

Length: body, 1.8–2.0 mm.; wings, 2.5 mm.

FEMALE: Similar to the male but the antennae are more broadly rounded at apex and the face is about two facets wide at its narrowest point.

Holotype male: Puu Kolekole, Molokai, 3,600 ft., July, 1953 (D. E. Hardy). Allotype female and nine paratypes: four males, five females, same data as type.

Type in B. P. Bishop Museum. Paratypes in the following collections: U. S. National Museum, British Museum (Natural History), Hawaiian Sugar Planters' Association, and the University of Hawaii.

***Campsicnemus hispidipes* Hardy and Kohn, new species (fig. 18e).**

Fitting in the group of species which lacks ciliation on middle tarsi, which has the basitarsus slender, no dorsal bristles on front tibia or on basal half of middle tibia, and which has the middle tibia ciliated along the entire anterodorsal surface (fig. 18e). It is related to *C. parvulus* n. sp. from Hawaii but differs by having the anterodorsal ciliation of middle tibia much more dense and closely set and made up of two rows of setae rather than just one row of moderately spaced setae.

MALE. A moderately small, dark-bodied species. *Head*: Eyes contiguous on the face for a distance equal to about four rows of eye facets. Front and vertex shining black in ground color, rather densely brown pollinose. Antenna yellow, tinged with brown on the third segment, third segment subacute just slightly longer than wide. *Thorax*: Black, brownish gray pollinose on the dorsum, gray on the sides. Four pairs of well-developed dorsocentral bristles and no acrostichal setae

present. Halteres yellow. *Legs*: Almost all yellow. Front femur devoid of ventral bristles. Front basitarsus very slightly curved, almost three times longer than second tarsal segment, and two-thirds as long as tibia. Middle femur moderately thickened, with a row of rather well-developed posteroventrals extending from about basal fourth to apical fourth of segment and with a row of shorter anteroventrals from apical fourth to about base of segment. Middle tibia straight or nearly so (fig. 18e), posteroventral surface with a row of moderately strong, erect bristles extending the entire length; anterodorsal and anterior surfaces densely covered with long hairs which are bent at apices; these consist of several rows extending from the dorsal almost to the ventral margin; the hairs of the uppermost anterodorsal row are about one-third longer than the others. Hind femur devoid of ventral bristles except for one on the posteroventral and one on the anteroventral margins at apex; the anterodorsal surface with a row of suberect setae, the longest approximately one-third the width of the segment. *Wings*: Almost hyaline, very lightly fumose. Fourth costal section just slightly longer than fifth. Last section of M_{3+4} about three times longer than m crossvein. *Abdomen*: Entirely black, gray pollinose, slightly shorter than thorax. The genitalia have not been relaxed for study.

Length: body, 1.85–2.00 mm.; wings, 2.60 mm.

FEMALE. Lacking the ornamented legs, the median portion of face about three-fourths as wide as one eye facet. The third antennal segment is more rounded, as wide as long.

Length: body, 2.20 mm.; wings, 2.85 mm.

Holotype male and allotype female: Kokee, Kauai, 3,600 ft. elevation, June, 1952 (D. E. Hardy). One hundred twenty-five paratypes are on hand (predominantly males) from the following localities on Kauai: same as type; Nualolo Valley, 3,400 ft., July, 1952 (D. E. Hardy); Alakai Swamp, 4,000 ft., July, 1952, and August, 1953 (D. E. Hardy); Halemanu Swamp, August, 1953 (D. E. Hardy); Poomau Valley, 3,400 ft., July, 1952 (D. E. Hardy); Koaie Stream, August, 1953 (D. E. Hardy); Waialeale Stream, 3,600 ft., August, 1953 (D. E. Hardy); Halemanu Valley, August, 1953 (D. E. Hardy); and Kawaikoi Stream, 3,700 ft., August, 1953 (D. E. Hardy). Also, two specimens on hand from Upper Olaa, Hawaii, July, 1952 (D. E. Hardy), and Hanalilolilo, Molokai, 4,000 ft., August, 1953 (M. Tamashiro) seem to belong here but are not being designated as paratypes.

Type and a series of paratypes in the B. P. Bishop Museum. Remainder of paratypes distributed among the following collections: U. S. National Museum, British Museum (Natural History), Hawaiian Sugar Planters' Association, State Department of Agriculture, and the University of Hawaii.

***Campsicnemus hoplitipodus* Adachi (fig. 19a–b).**

Campsicnemus hoplitipodus Adachi, 1953, Proc. Haw. Ent. Soc. 15:121, fig. 4a–b.

Endemic. Oahu (type locality: Mt. Tantalus, 2,000 ft.). Also known from the

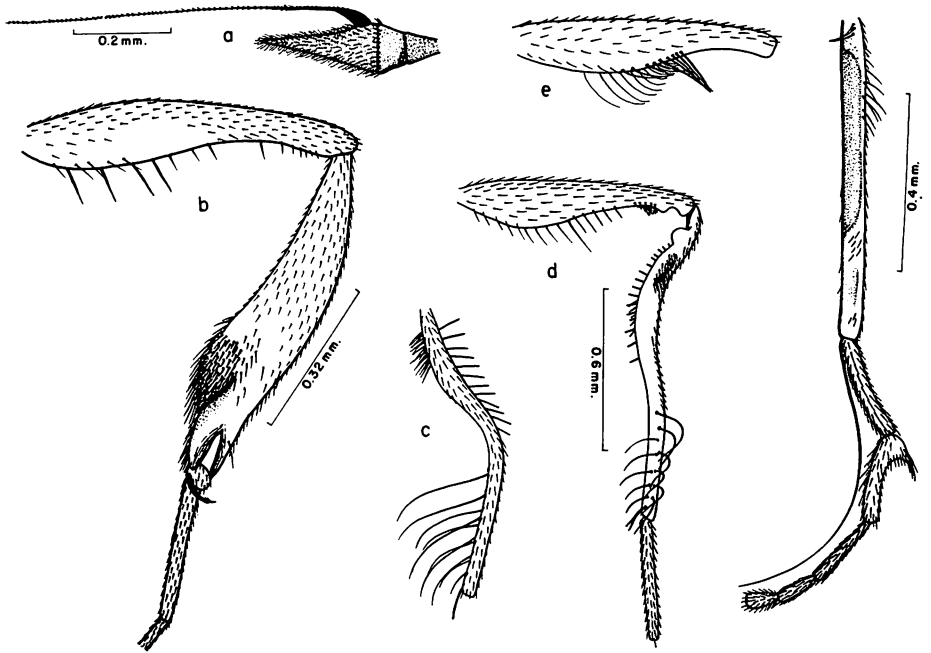


Figure 19—*Campsicnemus hoplitipodus* Adachi: a, antenna; b, middle femur, tibia, and basal two tarsal segments, anterior view. *C. hygrophilus* n. sp.: c, middle tibia, dorsal view; d, middle femur, tibia, and basitarsus, anterior view. *C. impariseta* n. sp.: e, middle femur, anterior view; f, middle tibia and tarsus, ventral view.

Upper Olaa Forest and Kulani, Hawaii, elevation 4,000–5,200 ft.

Type in the U.S. National Museum collection.

This species fits in the group which has the middle basitarsus short and armed with an apical spur, and the middle tibia not flattened dorsally. It is distinguished from other species in this complex by the very short middle basitarsus reduced to just a small knob (less than one-fifth the length of the second tarsal segment) and also by the rather strongly thickened tibia, and the very extensive patch of short setae on apical third (fig. 19b).

A small, dark-colored species. Antennae dark brown to black, third segment long-pointed, two or three times longer than wide (fig. 19a). Thorax black, densely dusted with brown on the dorsum. Mesonotum and scutellum blue-green in direct light. Legs largely yellow. Ventral surface of middle femur lined with long bristles. Each middle tibia slightly longer than femur, rather strongly thickened on apical third, and with a dense clump of short spines on anterodorsal margin at about apical third of segment. Middle basitarsus as wide as long, one-fifth or less the length of the following segment and terminating in a curved black spine. Other details as in figure 19b. Refer to original for more complete description.

Length: body, 1.7 mm.; wings, 2.0 mm.

***Campsicnemus hygrophilus* Hardy and Kohn, new species (fig. 19c-d).**

Fitting in the group which has the middle tibia sinuate and with a small projection near its base. Differing from related species by having numerous long, curved anterodorsal bristles at apical third of tibia and by the middle basitarsus lacking long cilia and only about one-third as long as tibia (fig. 19d).

MALE. Small, largely yellow species. *Head:* Eyes contiguous on middle of face for a distance equal to about four rows of eye facets. Lower portion of face yellow-gray pubescent. Antennae yellow, third segment tinged with brown, pointed at apex and about one-half longer than wide. *Thorax:* Entirely yellow, except for a brown to black spot on metapleura extending onto sides of metanotum and except for a rather faint brown vitta extending down each dorsocentral line. Four pairs of dorsocentral bristles and one row of acrostichals present. Halteres bright yellow. *Legs:* Almost entirely yellow. Front and hind legs not ornate. Middle femur moderately swollen, posteroventral surface with a row of six to eight rather strong black bristles extending from about the middle to the basal third of the segment and with another row of about eight smaller, closely placed bristles at the apex; anteroventral surface with a row of moderately small black bristles extending from apical third to basal third of segment. Each middle tibia slender, strongly sinuate, the sub-basal projection is small and rounded; the posteroventral surface has two rows of moderately strong, blunt bristles extending from the projection to near middle of segment; the anteroventral surface has a rather dense clump of moderately long bristles at about basal third (fig. 19c); the long curved bristles near apex of segment are situated on the anterodorsal and anterior surfaces. The middle basitarsus is about one-third as long as the tibia (fig. 19d). *Wings:* Hyaline or nearly so, just faintly fumose. Fourth costal section one-half longer than fifth. Last section of M_{3+4} two and one-half times longer than m crossvein. *Abdomen:* Yellow on the venter and on the sides and bases of terga, otherwise brown.

Length: body, 1.7 mm.; wings, 2.4 mm.

FEMALE. Fitting the description of the male except for lack of ornamentation on the legs, also the abdomen is predominantly brown.

Holotype male: Upper Olaa Forest, Hawaii, August, 1952 (D. E. Hardy). **Allotype female:** same data as type except collected by W. C. Mitchell. **Ten paratypes, nine males, one female:** same data as type and allotype (one taken July, 1956) and one specimen, Olaa Flume Road, Hawaii, 1,500 ft., August, 1952 (W. C. Mitchell).

Type, allotype, and some of the paratypes in the B. P. Bishop Museum. Remainder of paratypes in the following collections: U. S. National Museum, British Museum (Natural History), Hawaiian Sugar Planters' Association, and the University of Hawaii.

This species is collected on the ground litter in the dense fern jungle around the base of Mauna Loa.

***Campsicnemus impariseta* Hardy and Kohn, new species (fig. 19e-f).**

Fitting in the group of species which has no projection on middle tibia but which has a projection near base of second tarsal segment on middle legs. It is closely related to *C. chauliopodus* n. sp. but is distinguished by having just one very long apical bristle on middle tibia and by having the middle basitarsus longer than second segment and not produced at apex (fig. 19f).

MALE. Small, dark-bodied species. *Head:* Basal two segments of antennae yellow, tinged with brown. Third segment black, acute at apex, and about one-half longer than wide. Eyes separated on the upper portion by a width of about one row of eye facets. Face largely silvery gray pubescent, extreme upper portion dull gray-black. Front and vertex brown, the latter metallic blue-green in direct light. *Thorax:* Dark brown to black, densely brown pollinose on the dorsum; the faint metallic blue-black ground color shows through in direct light. Three pairs of dorsocentrals and no acrostichals present. Halteres yellow, tinged with brown on the knobs. *Legs:* Predominantly yellow. Middle and hind coxae dark brown to black, covered with gray pollen; all tarsi brown; middle and hind tibia and upper apical portion of hind femur tinged with brown. Front and hind legs lacking distinctive bristles except for a moderate-sized anteroventral bristle at apical one-fifth of segment. Each middle femur rather strongly swollen on basal two-thirds, attenuated apically, the posteroventral surface with a row of curved bristles extending over the median portion of the segment, the anteroventral surface with a row of very densely placed bristles at apical third (fig. 19e). Each middle tibia rather slender, almost straight-sided and flattened dorsoventrally with three or four basal bristles on posteroventral margin and a row of seven or eight posteroventral bristles at about basal two-fifths of segment; also with a row of posterodorsal bristles extending the entire length of the segment; these are stronger on the basal third. The elongate bristle at apex of tibia extends to or beyond the tip of the tarsus. The middle basitarsus is longer than the second segment, the second has a spur-like process developed at its base, and has two or three short bristles at its apex (fig. 19f). *Wings:* Hyaline, very faintly fumose. Fourth costal section one-third to one-half longer than fifth. Last section of M_{3+4} about three times longer than m crossvein. *Abdomen:* Entirely black, covered with gray-brown pollen, about equal in length to the thorax. The genitalia have not been relaxed for study.

Length: body, 1.35 mm.; wings, 2.00 mm.

FEMALE. Unknown.

Holotype male: Kilauea, Hawaii, December, 1950 (N. L. H. Krauss). One male paratype: Upper Olaa Forest, Hawaii, 4,000 ft., July, 1956 (D. E. Hardy).

Type in the B. P. Bishop Museum. Paratype in University of Hawaii collection.

Campsicnemus inaequalis Hardy and Kohn, new species (fig. 20a).

Fitting in the group of species which lacks ciliation on middle tarsus, which has the basitarsus slender, which has no dorsal bristle on front tibia or on basal half of middle tibia, and which has fine ciliation extending along the entire anterodorsal surface of middle tibia. It is differentiated from other species in this complex by having the ciliation on anterodorsal surface of middle tibia sparse and irregularly spaced.

MALE. Moderately small, dark-bodied species. *Head:* Eyes contiguous on the face for a distance of about three rows of eye facets. Upper and lower portions of face gray pubescent. Front and vertex shining black in ground color, rather densely gray pollinose. Antennae yellow, tinged with brown on the third segment, third segment subacute, about as wide as long. *Thorax:* Almost entirely black, tinged with yellow around wing bases and around propleura and humeri. Mesonotum as well as pleura rather densely gray pollinose. Four pairs of well-developed dorsocentrals and no acrostichals present. Halteres yellow. *Legs:* Almost all yellow. Front femur devoid of ventral bristles. Front basitarsus straight or nearly so, almost three times longer than second tarsal segment and three-fourths as long as tibia. Middle femur moderately swollen, with six to eight rather strong bristles extending from about basal fourth to apical third. Middle tibia straight, posterior surface with a row of short, erect setae extending the entire length of the segment; anteroventral surface with long curved, sparsely spaced hairs extending the entire length (fig. 20a). Middle basitarsus two-thirds longer than second tarsal segment and a little over one-third as long as the tibia. Hind femur with rather distinct anteroventral bristles extending over median portion. Anterodorsal surface of hind tibia with one bristle near basal fourth, one near apical two-fifths, and one preapical; dorsal surface with one moderately developed bristle just below middle and one small bristle at apical third beside the preapical. *Wings:* Lightly fumose. Fourth costal section one-third longer than fifth. Last section of vein M_{3+4} two and one-half times longer than m crossvein. *Abdomen:* Entirely black, rather densely gray pollinose.

Length: body, 1.7 mm.; wings, 2.3 mm.

FEMALE. Similar to the male but lacking ornamentation on the legs; the face at its narrowest point is about equal in width to one row of eye facets. The third antennal segment is rounded and is as wide as long.

Length: body, 2.0 mm.; wings, 2.5 mm.

Holotype male and allotype female: Pauahi, Hawaii, 4,300 ft., August, 1952 (D. E. Hardy). Fifteen paratypes (13 males and 2 females) from the following localities on Hawaii: same as type, some taken August, 1956 (D. E. Hardy and W. C. Mitchell); near Pawaina, Kona, 3,000 ft., July, 1953 (D. E. Hardy); and Upper Olaa Forest, August, 1952 (W. C. Mitchell).

Type, allotype, and some of the paratypes in the B. P. Bishop Museum. Remainder of paratypes distributed among the following collections: U.S. National

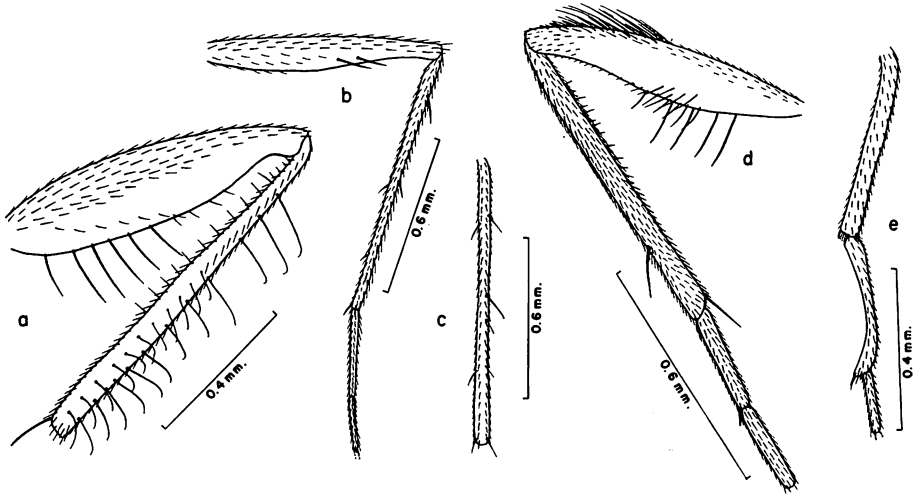


Figure 20—*Campsicnemus inaequalis* n. sp.: a, middle femur and tibia, anterior view. *C. indecorus* n. sp.: b, middle femur, tibia, and basal two tarsal segments, anterior view; c, hind tibia, dorsal view. *C. inermipes* Malloch: d, middle femur, tibia, and basal two tarsal segments, anterior view; e, front tibia and basal two tarsal segments.

Museum, British Museum (Natural History), Hawaiian Sugar Planters' Association, and the University of Hawaii.

***Campsicnemus indecorus* Hardy and Kohn, new species (fig. 20b–c).**

Fitting in the group of species with the middle tarsi not ciliated and the basitarsus simple and slender, with no dorsal bristle on front tibia and the middle tibia straight, and with an anterodorsal and a dorsal bristle on basal two-fifths of segment. It closely resembles *C. deficiens* Parent but is differentiated by the middle femur having two moderately strong bristles on lower portion of anterior surface at apical two-fifths of segment, by having the anterodorsal bristle of middle tibia closer to the base of segment than to the dorsal bristle, by having two short ventral bristles on middle tibia (one at middle and one at apical fourth), and by having four dorsal bristles on hind tibia (three between basal two-fifths and apical one-third) besides the three anterodorsal bristles (fig. 20c).

MALE. Head: Eyes contiguous for a distance equal to about five rows of eye facets. Lower and upper portions of face rather densely yellow-brown pollinose. Front and vertex metallic black in ground color, covered with brown pollen. Basal two segments of antennae yellow; third brown, tinged with yellow at its base, triangular, just slightly longer than wide. **Thorax:** Mesonotum largely brown, rather densely covered with brown pollen, yellow on the sides; humeri and scutellum yellow, tinged lightly with brown; upper portions of pleura yellow-brown, lower portions yellow. Halteres yellow. Three pairs of dorsocentrals and no acrostichals present. **Legs:** Yellow. Front and hind femora without ventral bristles

except for one or two at apices. Middle femur slender with no ventral bristles except for a small one at apex on posteroventral surface; anterior surface with two rather strong black bristles at apical two-fifths, these are situated just above the anteroventral line (fig. 20b). Middle tibia straight and slender, one anterodorsal bristle near basal fifth of segment and a small dorsal bristle near basal two-fifths. Middle basitarsus two-thirds longer than second segment and about one-third as long as tibia. Anterodorsal surface of hind tibia with one bristle at basal fourth, one at apical fourth, and one at apex; dorsal surface with only one distinct bristle above apex, this is situated near the middle of the segment. *Wings*: Light brown fumose. Fourth costal section one-half longer than fifth. Last section of M_{3+4} three times longer than m crossvein. *Abdomen*: Entirely black.

Length: body, 1.60 mm.; wings, 2.25 mm.

FEMALE. One female at hand apparently belongs here. It fits the description of the male in most details except for the characters of the middle legs and except that the eyes are separated on the front for a distance equal to one and a half to two rows of eye facets.

Holotype male and allotype female: Puu Kolekole, Molokai, July, 1952 (M. Tamashiro). Both in B. P. Bishop Museum.

***Campsicnemus inermipes* Malloch (fig. 20d-e).**

Campsicnemus inermipes Malloch, 1932, *Stylops* 1:123.

Endemic. Oahu (type locality: Kaumuahona). Known only from the type, the headless allotype, and from one male taken on Konahuanui, Oahu, 2,750 ft., November, 1936 (F. X. Williams). The type locality cannot be located in the gazetteer. It might be a misspelling.

Type in the B. P. Bishop Museum. We have studied all of the known specimens.

Fitting in the group of species which has a spur at apex of middle basitarsus and apparently representing a transitional stage between the species with short midbasitarsi and those with long midbasitarsi. In the key to species it fits near *C. profusus* n. sp. but the two are not related. The development of the legs is very different as shown in figure 20d-e and as noted below.

Entirely yellow species except for a brown spot on metapleura and for a brownish tinge in the ground color of the mesonotum. Third antennal segment rather sharp-pointed but scarcely one-half longer than wide. Four pairs of dorso-central bristles and a few pale inconspicuous acrostichal setae present. Legs clear yellow, all femora rather slender. Front femur devoid of ventral bristles except for one or two anteroventrals and posteroventrals at extreme apex. Front basitarsus slender, slightly curved, two times longer than second segment and about two-thirds as long as tibia (fig. 20e). Middle femur with fine pale anterodorsal hairs on apical half of segment; with about five rather long yellow-brown posteroventral bristles at middle of segment and with a row of anteroventral bristles extending from near middle of segment to just before the apex; these be-

come shorter and finer as they proceed apically. Middle tibia straight and rather slender, ventral surface covered with numerous short erect setae extending the entire length of the segment, a strong ventral bristle present at apex, and a rather weak anterior and an anterodorsal bristle situated at apical one-fourth of segment. Middle basitarsus slender, about equal in length to second segment and with a straight spur at apex (fig. 20d).

Length: body, 1.75 mm.; wings, 2.00 mm.

Campsicnemus insuetus Hardy and Kohn, new species (fig. 21a-c).

This species differs from all other Hawaiian *Campsicnemus* by the large projection in middle of middle tibia as well as by other details of the middle legs as shown in figure 21a-b and as described below.

MALE. Head: Eyes contiguous on the face for a distance equal to the length of five eye facets. Lower portion of face densely yellow-gray pubescent. Front and vertex metallic black in ground color covered with brown pubescence. Antennae black, third segment sharp-pointed, and about two times longer than wide (fig. 21c). **Thorax:** Mesonotum polished brown to black in ground color, rather densely covered with brown pollen. Scutellum metallic blue in ground color with gray-brown pollen. Upper portion of pleura brown, lower portion and halteres yellow. Four pairs of dorsocentral bristles and one row of acrostichals present. **Legs:** Front coxa and all femora yellow. Hind femora tinged with brown at apices. Middle and hind coxae yellow-brown. Front tibia largely yellow, tinged with brown above. Middle and hind tibiae and all tarsi brown. The middle tibiae yellow ventrally on basal half. Front legs not ornate, each front femur with a row of small but distinct anteroventrals and a row of small posteroventrals extending the entire length of the segment; the posteroventrals are moderately strong on the apical fourth of the segment. Each middle femur is rather slender; the posteroventral surface has a row of six or eight closely placed, curved bristles near basal third and two or three bristles near apical third. Each middle tibia rather contorted, with a strong swelling at about basal two-fifths. This is densely covered with moderately short bristles and hairs over anterodorsal surface and with a strong knob-like process on anterior margin at about middle of segment. This is densely covered with long, curled bristles (fig. 21a); also with several strong posterodorsals on the swollen portion and one rather strong anterodorsal near base of knob; also with five moderately strong anterodorsals at apical fourth of segment (fig. 21b). Middle basitarsus long and slender, as long as tibia, and with a row of rather long bristles down the anterodorsal surface. Hind femora devoid of conspicuous ventral bristles. **Wings:** Slightly brownish fumose. Fourth costal section one-third to one-half longer than fifth. Veins R_{4+5} and M_{1+2} very slightly converging toward their apices. Last section of M_{3+4} about two times longer than m crossvein. **Abdomen:** Entirely black covered with gray-brown pollen, about equal in length to the thorax. The genitalia have not been relaxed for study.

Length: body, 2.1-2.2 mm.; wings, 2.6 mm.

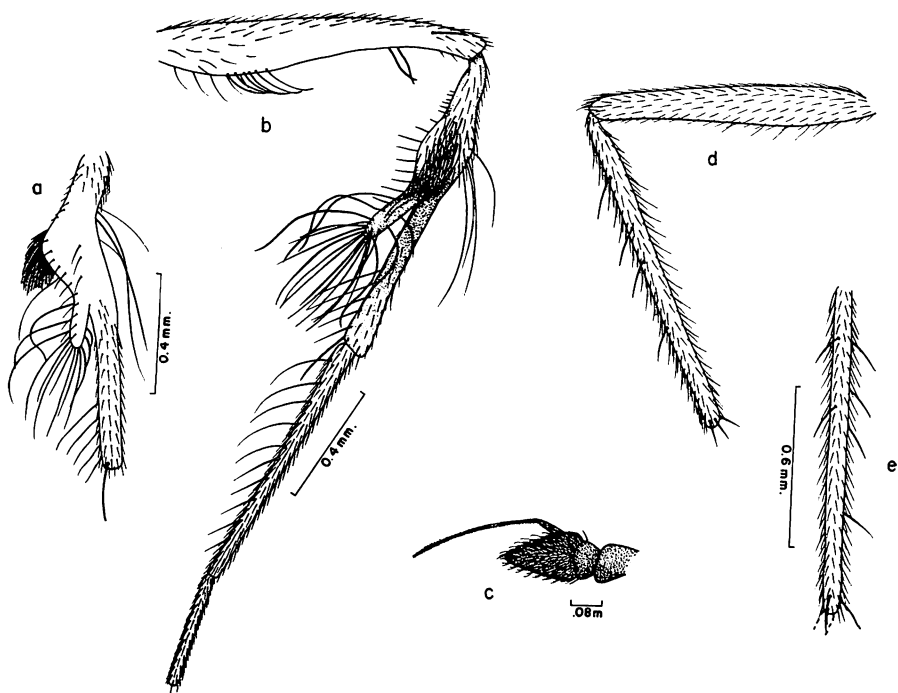


Figure 21—*Campsicnemus insuetus* n. sp.: a, middle tibia, dorsal view; b, middle femur, tibia, and basal two tarsal segments, anterior view; c, antenna. *C. labilis* n. sp.: d, middle femur and tibia, anterior view; e, middle tibia, dorsal view.

FEMALE. Unknown.

Holotype male: Nualolo Valley, Kauai, 3,400 ft., July, 1952 (D. E. Hardy).
One paratype male: head of Nualolo Valley, Kauai, July, 1952 (D. E. Hardy).

Type in the B. P. Bishop Museum, paratype in the University of Hawaii collection.

***Campsicnemus labilis* Hardy and Kohn, new species (fig. 21d–e).**

Fitting in the *tibialis* group by having the middle basitarsus slender and lacking long ciliation, and with the eyes of the male widely separated. It is closest related to *C. ephydrus* n. sp. but is distinguished by having two dorsal bristles near middle of front tibia; by lacking the bump-like projection of the middle tibia characteristic of *ephydrus* and with only four distinct bristles scattered over anterior dorsal surface; and by the inconspicuous ventral setae on middle femur and the two strong anterior bristles before apex of hind femur.

MALE. Moderate-sized, predominantly black-bodied and gray pollinose species. **Head:** The face is obviously rather broad but cannot be clearly seen on the specimens at hand since the eyes are sunken in. Front and vertex black, covered with brownish gray pollen. Antennae black, third segment rounded at apex, and about

one-half longer than wide. *Thorax*: Black, rather densely gray pollinose. Humeri brownish yellow. Stems of halteres yellow; knobs brown, tinged with yellow. Five pairs of strong dorsocentrals and one row of well-developed acrostichals present. *Legs*: Front coxae, trochanters, and ventral portions of all femora yellow; legs otherwise brown to black. Front femur with inconspicuous erect setae along ventral surface, the length of these scarcely equal to two-fifths the width of the segment. Front tibia with two dorsal bristles arranged near middle of segment. Front basitarsus about three-fifths as long as tibia and almost two times longer than second tarsal segment. Middle femur rather slender and devoid of conspicuous ventral bristles, ventral surface with only scattered small setae, the longest of these is about half the width of the femur (fig. 21d). Middle tibia with a row of short, erect posteroventral and a row of ventral bristles; anterodorsal surface with four bristles arranged before apical two-fifths; dorsal surface with two bristles, one near basal one-sixth and one at about basal two-fifths (fig. 21e). Middle basitarsus about one-third longer than second tarsal segment. Hind femur with two strong anterior bristles before apex, also with rather distinctly developed anteroventral bristles especially on apical half of segment. Hind tibia with five anterodorsals arranged before apex, one near basal seventh and four arranged between the basal third and apical third of segment; four dorsal bristles before apex, one near basal sixth and three between basal third and apical third of segment. *Wings*: Light brown fumose. Fourth costal section two-thirds longer than fifth. Veins R_{4+5} and M_{1+2} parallel. Last section of M_{3+4} two times longer than m crossvein. *Abdomen*: Black in ground color, densely covered with gray-brown pollen with a faint greenish sheen in direct light; about equal in length to the thorax.

Length: body, 2.1–2.4 mm.; wings, 3.1–3.4 mm.

FEMALE. Similar to the male in most respects. The face is very broad; at its narrowest point it is equal in width to about five or six rows of eye facets. The third antennal segment is broadly rounded and is as wide as long. The middle femur has elongate hair-like bristles extending down the entire length of the ventral surface, the longest of these is one-third to one-half longer than the width of the femur. The acrostichal bristles are arranged irregularly in two rows on the mesonotum.

Length: body, 3.1 mm.; wings, 4.0 mm.

Holotype male: Kula Pipeline, Maui, above Waikamoi, 4,200 ft., July, 1956 (D. E. Hardy). Allotype female and seven paratypes (two males and five females): same data as type, 4,000–4,200 ft., collected on surface of small pools (D. E. Hardy and R. Namba).

Type and allotype in B. P. Bishop Museum. Paratypes in the following collections: U. S. National Museum, British Museum (Natural History), Hawaiian Sugar Planters' Association, and the University of Hawaii.

***Campsicnemus latipenna* Hardy and Kohn, new species (fig. 22a–c).**

Fitting in the group of species which has the middle tibia slender, nearly straight, and with a sub-basal projection. It is distinguished from all other known

species of *Campsicnemus* by the peculiarly shaped wings (fig. 22a) and by the development of the third tarsal segment of the front legs (fig. 22b).

MALE. A small, dark-bodied species. *Head:* Eyes almost contiguous on the upper portion of the face, lower portion of the face densely brownish yellow pubescent. Antennae brownish yellow, third segment as wide as long; arista basal. Front and vertex brown pollinose, greenish blue in direct light. *Thorax:* Dark brown to black in ground color. Gray-brown pollinose on the dorsum, sub-metallic blue-green or slightly coppery on the mesonotum and scutellum when seen in direct light. Halteres yellow. *Legs:* Yellow except for brown middle and hind coxae and all tarsi. Front femur devoid of ventral bristles except for one rather small posteroventral near apex. Front tibia with one strong posteroventral near middle and with two strong posterodorsals, one at basal two-fifths and one at apical one-sixth of segment. The third tarsal segment of front legs is flat and thick on basal three-fifths and developed into a slight hook (fig. 22b). Each hind femur with three or four anteroventral bristles at apical third of segment. Each hind tibia with one rather small anteroventral at apical third and with five strong anterodorsals; also with four strong posterodorsals. Each middle femur has a row of black hook-like anteroventral bristles extending from near middle to about the apical one-fifth, ending opposite the posterior bristle. Each middle tibia long and slender, just slightly curved in the median portion, not distinctly sinuate, two-thirds longer than the femur; and with a projection on the anterior margin near base (fig. 22c). The second and third tarsal segments of the middle legs have numerous long curved cilia on the dorsal surface. *Wings:* Dusky fumose, broadest at about level of apex of vein M_{3+4} , somewhat narrowed apically and very strongly narrowed basally. Vein M_{1+2} curves downward as it extends toward the wing apex so that cell R_5 opposite the m crossvein is only about two-thirds as wide as at the wing margin. Fourth costal section about two-thirds longer than fifth. Last section of M_{3+4} almost vertical in position, evanescent before the wing margin; the remaining portion of the vein is just slightly longer than m crossvein (fig. 22a). *Abdomen:* Entirely opaque, densely covered with brownish gray pollen, rather short, scarcely longer than the thorax.

Length: body, 1.5 mm.; wings, 2.2 mm. by 0.8 mm. at widest point.

Holotype male and one paratype male: Puu Kukui, Maui, 3,000–4,500 ft., June, 1953 (D. E. Hardy and C. R. Joyce).

Type in the B. P. Bishop Museum. Paratype in the University of Hawaii collection.

***Campsicnemus lepidochaetes* Hardy and Kohn, new species (fig. 22d–g).**

Closely related to *C. contortus* Parent but the characteristics of the legs are quite different. It is best distinguished by lack of a pointed projection at apical third of middle tibia and by the row of three scale-like bristles near apical third, and also by the differences in the bristling at the base of the tibia as well as the

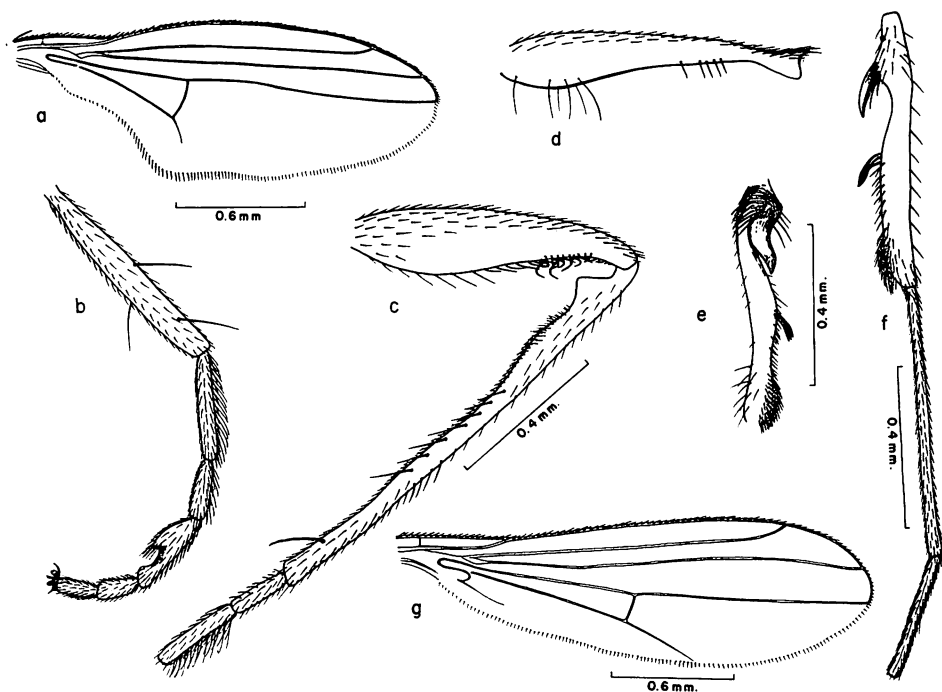


Figure 22—*Campsiccismus latipenna* n. sp.: a, wing; b, front tibia and tarsus; c, middle femur, tibia, and basal two tarsal segments, anterior view. *C. lepidochaetes* n. sp.: d, middle femur, anterior view; e, middle tibia, anteroventral view; f, middle tibia and basal two tarsal segments, dorsal view; g, wing.

bristling of middle femur as shown in figure 22d, and by possessing only two or three long anteroventral bristles on the hind femur.

MALE. Head: Face yellow, lower two-fifths densely silvery pubescent, completely obscuring the ground coloring; rather broad and parallel-sided, about equal in width to eight or nine rows of eye facets. Antennae dark brown to black, third segment cone-shaped, rather sharply pointed at apex, about two and one-third times longer than wide. Front and vertex shining black in ground color, lightly brownish gray dusted. Upper occipital bristle black, those of the lower portion and on the genae and mouthparts yellow. **Thorax:** Predominantly dark brown to black; only the lower portion of the pleura and the stems of halteres are yellow. Mesonotum and scutellum sub-shining, rather densely covered with brown pollen. Four pairs of dorsocentral bristles are present. **Wings:** Faintly brown fumose. Fourth costal section two times longer than fifth. Veins R_{4+5} and M_{1+2} almost parallel. Last section of M_{3+4} almost three times longer than the m cross-vein (fig. 22g). **Legs:** Front coxae and all femora, except for slightly brownish apices of the hind femora, entirely yellow; remainder of legs yellow-brown to brown. Each middle femur thickened basally and attenuated on apical half, with rather scattered, dark-colored bristles over the anterior and anteroventral surfaces

and with five small black anteroventral bristles in a row at apical fourth (fig. 22d). Each middle tibia with a yellow anterior projection near base, rather strongly curved on anterior median surface and swollen on apical portion (fig. 22e). Each middle tibia also with a row of six to eight short anteroventral bristles at base plus a row of about six black very closely placed basal bristles on anterior face behind the sub-basal projection and a row of three or four flattened bristles closely placed on anterodorsal surface just above the projection (fig. 22f). Front femora devoid of ventral bristles. Each hind femur with two moderately long, yellow-brown anteroventral bristles at apical third and with a few scattered pale hairs or short bristles continuing irregularly toward the base of the segment. *Abdomen*: Entirely dark brown to black; dull colored, covered with gray-brown pollen. The genitalia have not been dissected.

Length: body, 1.7 mm., wings, 2.4 mm.

FEMALE. Third antennal segment just slightly longer than wide, legs not ornamented, otherwise similar to the male.

Holotype male, allotype female, and eight paratypes (six males and two females): Lanaihale, Lanai, 3,200 ft., June, 1953, collected on small pools of water on the mountain top (D. E. Hardy).

Type and allotype in the B. P. Bishop Museum. Paratypes in the following collections: U. S. National Museum, British Museum (Natural History), Hawaiian Sugar Planters' Association, and the University of Hawaii.

***Campsicnemus longiciliatus* Parent (fig. 23a-b).**

Campsicnemus longiciliatus Parent, 1939, Proc. Haw. Ent. Soc. 10:229, figs. 9-11.

Endemic. Oahu (type locality: Konahuanui Trail, 2,000 ft.). Known only from the Koolau Mountains.

Type in the Hawaiian Sugar Planters' Association collection.

Fitting in the group of species which lacks a spur on middle basitarsus and which has erect cilia on basal two segments of middle tarsus and which has the middle tibia only slightly curved and the third segment of middle tarsus longer than second.

A yellow species, discolored with brown on the dorsum of the abdomen and on the mesonotum, with a brown vitta down each dorsocentral row. Middle femur moderately swollen, with ventral bristles extending from about basal fifth to apical fifth of segment. Middle tibia only slightly curved, almost straight in dorsal view, with a dense clump of curved cilia near base on anterior and anterodorsal surfaces; anteroventral surface with a row of moderately long bristles extending from the basal clump to the apex of the segment. Posteroventral and ventral surfaces with numerous rather short erect setae extending the entire length. Middle tarsi with moderately long ciliation on anterior surface of basal two or three segments, basal segment long and slender, two times longer than

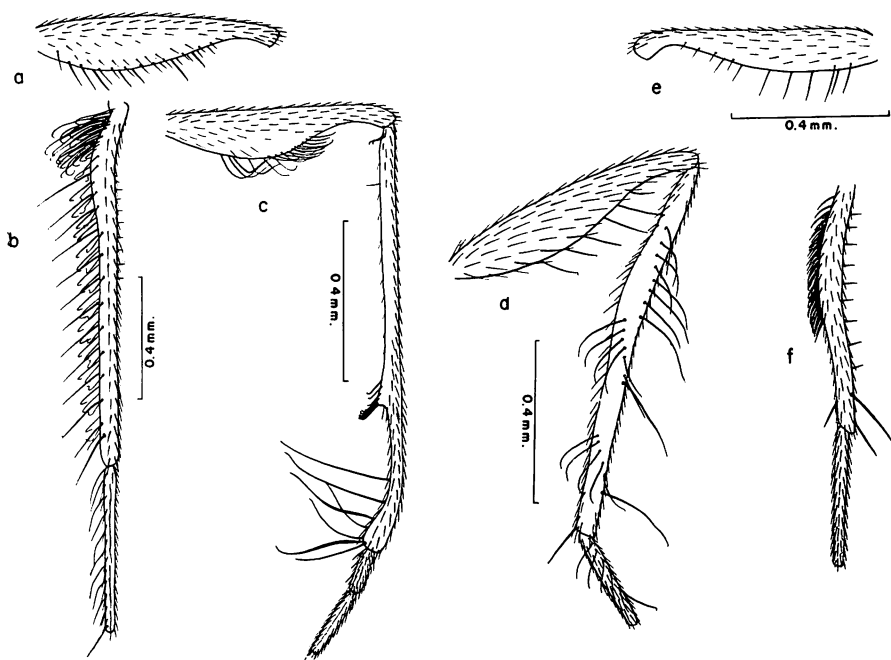


Figure 23—*Campsicnemus longiciliatus* Parent: a, middle femur, anterior view; b, middle tibia and basitarsus, dorsal view. *C. longitibia* n. sp.: c, middle femur, tibia, and basal two tarsal segments. *C. loxothrix* n. sp.: d, middle femur, tibia, and basitarsus, anterior view. *C. macula* Parent: e, middle femur, anterior view; f, middle tibia and basitarsus, dorsal view.

second tarsal segment and about one-half as long as tibia. For further details refer to figure 23a–b and to the original description.

Length: body, 1.8 mm.; wings, 2.6 mm.

***Campsicnemus longitibia* Hardy and Kohn, new species (fig. 23c).**

Fitting in the group of species which has the middle basitarsus short, running in the key near *C. nigricollis* Van Duzee, from Kauai, but apparently not related to this species. It differs by being much smaller, by having the femora yellow, only three pairs of dorsocentral bristles, the middle tibia very long and slender with no ventral truncate bristles, and possessing a small projection on apical third of segment (fig. 23c).

MALE. Small, dark-bodied species. **Head:** Eyes almost contiguous below the antennae, lower portion of face brown pollinose. Front and vertex brown, metallic blue in direct light. Antennae dark brown to black, third segment about as wide as long, subacutely pointed at apex. Arista basal, rather long pubescence. **Thorax:** Mesonotum and scutellum rather densely covered with brown pollen, metallic blue-green in direct light, especially in the median portion. Three pairs of well-developed dorsocentrals are present and no acrostichals. Halteres yellow.

Legs: Predominantly yellow, middle and hind coxae and all tarsi brown, apical portion of hind femur discolored with brown above. The front and hind legs without distinct ventral bristles or ciliation, except for a row of moderately long anteroventrals on basal half of hind tibia. Each middle femur is swollen on basal two-thirds and rather strongly attenuated at apex, with a row of closely placed long, curved, anteroventral bristles extending from basal third to apical third. Middle tibia very long and slender, two-thirds longer than femur and two times longer than tarsi; with a spine-like process developed on anterior margin at apical one-third, and with a row of five or six very long slender anteroventral hairs near the apex of the segment (fig. 23c); also with three closely placed anteroventral bristles at base of segment. *Wings:* Faintly fumose. Fourth costal section one-half longer than fifth. Last section of M_{3+4} three to four times longer than m crossvein. *Abdomen:* A little longer than the thorax, entirely dull black.

Length: body, 1.30 mm.; wings, 1.65 mm.

FEMALE. Upper portion of face brown, about equal in width to two rows of eye facets. Lower portion gray pubescent. Third antennal segment more rounded at apex, arista subapical. Legs not ornate. Otherwise fitting the description of the male.

Type male: Manawainui Valley, Molokai, July, 1952 (M. Tamashiro). Allotype female: Puu Alii, Molokai, 4,200 ft., July, 1953 (D. E. Hardy). Ten paratypes (six females, four males): six same locality as type, August, 1953 (D. E. Hardy); three, same data as allotype; and one from Puu O Kaeha, Molokai, 3,700 ft., July, 1953 (D. E. Hardy).

Type, allotype, and some of the paratypes in the B. P. Bishop Museum. The remainder deposited in the following collections: U. S. National Museum, British Museum (Natural History), Hawaii Sugar Planters' Association, and the University of Hawaii.

***Campsicnemus loxothrix* Hardy and Kohn, new species (fig. 23d).**

Belonging in the group of species which has the middle basitarsus longer than second tarsal segment, with no spur at apex and long cilia only on the middle basitarsus. It fits near *C. restrictus* n. sp., but the diagonally placed rows of bristles on middle tibia and the shorter middle basitarsus (fig. 23d) will differentiate it. Also, the bristling of the middle femur and shape of hind tibia are very different.

MALE. *Head:* Antennae brown, tinged with yellow on the basal segments. Third segment rather sharply pointed at apex, about one-half longer than wide. Face comparatively broad; at its narrowest point it is equal to two rows of eye facets. *Thorax:* Brown, with five pairs of dorsocentral bristles and rather well-developed acrostichals arranged irregularly in two rows. Halteres yellow. *Legs:* Yellow except for yellow-brown tarsi and middle coxae. Front and hind legs without unusual bristles. Middle femur rather slender, with a row of about six posteroventral bristles extending from middle to apex of segment. Middle tibia slender, bent posteriorly on basal third as seen from direct dorsal view; anterior

surface with three rows of long, yellow to yellow-brown bristles which extend diagonally on to the dorsal surface, one near basal third, one near middle, and one (short row) near apical one-fourth of segment (fig. 23d). Middle basitarsus distinctly longer than second tarsal segment and about one-fourth as long as tibia. *Wings*: Subhyaline. Fourth costal section one-half longer than fifth. Last section of M_{3+4} three times longer than m crossvein. *Abdomen*: Brown, tinged lightly with yellow, about equal in length to the thorax.

Length: body, 1.5–1.7 mm.; wings, 2.1–2.3 mm.

FEMALE. The third antennal segment is obtuse at apex. The face is three to four rows of facets wide at its narrowest point and the legs lack the ornamentations characteristic of the male.

Holotype male: Upper Olaa Forest, Hawaii, August, 1952 (W. C. Mitchell). Allotype female: same locality as type, July, 1953 (D. E. Hardy). Ninety-two paratypes, predominantly males, mostly same data as type and allotype, and also from the following localities on the island of Hawaii: Olaa Flume Road, 1,500 ft., August, 1952 (W. C. Mitchell); Kulani, 5,200 ft., August, 1952 (W. C. Mitchell and D. E. Hardy); and Kilauea, Hawaii National Park, December, 1950 (N. L. H. Krauss).

Type, allotype, and some of the paratypes in the B. P. Bishop Museum. Remainder of paratypes in the following collections: U. S. National Museum, British Museum (Natural History), Hawaiian Sugar Planters' Association, State Department of Agriculture, and the University of Hawaii.

***Campsicnemus macula* Parent (fig. 23e–f).**

Campsicnemus macula Parent, 1939, Proc. Haw. Ent. Soc. 10:229, fig. 12.

Endemic. Maui (type locality: Haleakala, 3,500 ft., "ground"), Oahu, and Hawaii. It is common on the ground litter in the wet rain forests around Mauna Kea, Mauna Loa, and Hualalai on the island of Hawaii.

Type in the Hawaiian Sugar Planters' Association collection. Cotypes from Haleakala are in the Museum National d'Histoire Naturelle, Paris.

Fitting in the group of species which lacks ciliation on middle tarsus and with the basitarsus slender and simple. It is differentiated from other species in this complex by having the basal half of middle tibia with a row of strong anterior bristles and the m crossvein infuscated.

Moderately small, dark-bodied species. Basal segments of antenna yellow-brown, third segment yellow-brown to brown, rounded at apex and about as wide as long. Legs marked with brown on the upper apical third of hind femur and upper basal portion of front femur; often the apical half of each middle and hind femur is brown. Front femur moderately thickened, with a group of postero-dorsal bristles near base. Front basitarsus slightly curved, about two-thirds longer than second tarsal segment. Middle femur slender, with a row of rather strong posteroventral bristles extending from about basal fourth to apical third and with a row of shorter, more hair-like anteroventrals extending along the same

portion of the segment (fig. 23e). Middle tibia slender, gently arcuate as seen in dorsal view, posteroventral surface with a row of rather strong, erect bristles extending the entire length of the segment; the anterior bristles are comb-like, situated very close together over the basal half (fig. 23f). Middle basitarsus slender, two-thirds longer than the second segment and over one-half as long as the tibia.

Length: body, 1.6 mm.; wings, 2.1 mm.

***Campsicnemus mediofloccus* Hardy and Kohn, new species (fig. 24a–b).**

Fitting in the group of species which lacks ciliation on middle tarsus, which has the middle basitarsus simple and slender, and the middle tibia straight and just slightly swollen. It differs from other species in this complex by having a very dense clump of long hairs at middle of middle tibia (fig. 24a).

MALE. *Head:* Eyes contiguous on the front for a distance equal to the length of three rows of eye facets. Lower portion of face gray pubescent. Front and vertex rather densely yellow-brown pollinose, the shining black ground color just faintly showing in direct light. Antennae yellow, third segment tinged slightly with brown around the apex, obtuse, and just slightly longer than wide; arista yellow-brown. *Thorax:* Entirely black, gray on the sides, gray-brown pollinose above. Four pairs of dorsocentral bristles and no acrostichals present. Halteres clear yellow. *Legs:* Predominantly yellow. Front femur moderately thickened with a row of distinct anteroventral bristles extending from basal third to near base of segment. Front tibia with several rows of short brownish yellow setae extending the entire length of the segment on the dorsal and anterodorsal surfaces. Front basitarsus slightly curved, about two-thirds longer than second segment and about two-thirds as long as tibia, and with a moderately developed ventral bristle at apex (fig. 24b). Middle femur rather slender, attenuated at apex, and developed into a slight lobate ventral process just before the apex; posteroventral surface with 10 to 12 moderately developed bristles extending almost the entire length of the segment; anteroventral surface with only a few short setae developed near the apical third of segment. Middle tibia slender, straight, slightly swollen in the median portion, with a row of short, erect setae down each anteroventral and posteroventral surface, and with a dense median clump as shown in figure 24a. Middle basitarsus long and slender, about two-thirds longer than second segment and almost three-fifths as long as tibia. Hind femur with distinct but small anteroventral bristles extending over most of the segment. Three anterodorsal bristles on hind tibia, one near basal third, one at apical two-fifths, and one just before the apex. *Wings:* Lightly brownish fumose, fourth costal section a little longer than fifth. Last section of M_{3+4} two and one-half times longer than m crossvein. *Abdomen:* Entirely black, shorter than the thorax. The genitalia have not been relaxed for study.

Length: body, 1.70 mm.; wings, 2.65 mm.

FEMALE. Unknown.

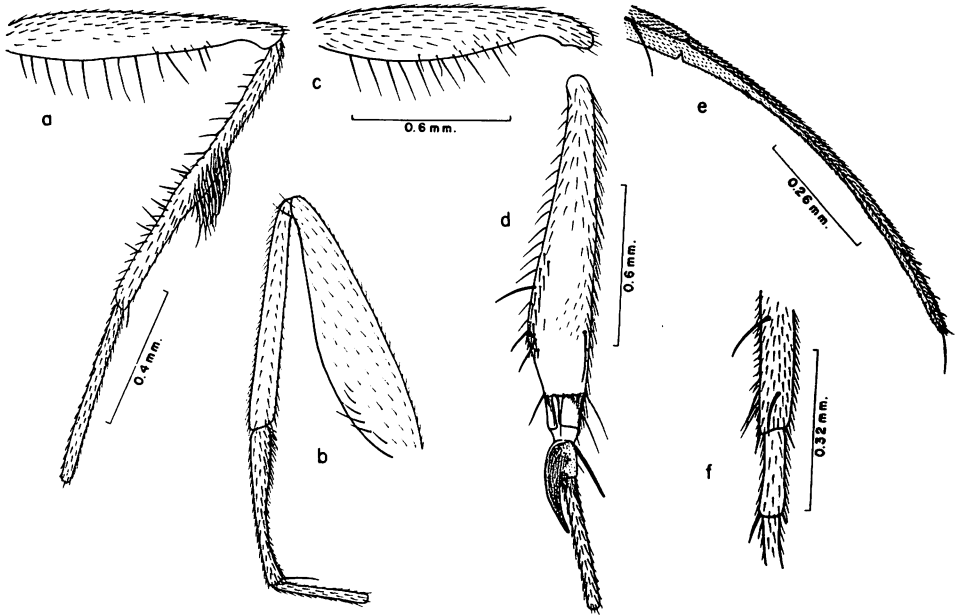


Figure 24—*Campsicnemus mediotloccus* n. sp.: a, middle femur, tibia, and basitarsus, anterior view; b, front femur, tibia, and basal two tarsal segments, posterior view. *C. membranilobus* Parent: c, middle femur, anterior view; d, middle tibia and basal two tarsal segments, dorsal view. *C. mirabilis* (Grimshaw): e, wing; f, apex of middle tibia and basitarsus, dorsal view.

Holotype male: Paliku, Haleakala Crater, Maui, June, 1952 (D. E. Hardy).
Type in the B. P. Bishop Museum.

***Campsicnemus membranilobus* Parent (fig. 24c-d).**

Campsicnemus membranilobus Parent, 1939, Proc. Haw. Ent. Soc. 10:230, fig. 13.

Endemic. Oahu (type locality: Mt. Kaala, 1,800 ft.). Known only from the Waianae Mountains.

Type in the British Museum (Natural History). Two topotypic species are in the Hawaiian Sugar Planters' Association collection (containing the same data as type).

A predominantly yellow species belonging in the group with short basitarsi on middle legs and fitting close to *C. distortipes* Grimshaw; the middle tibia is not twisted, however, the anteroventral projection on middle basitarsus is more slender-pointed at apex, and the basitarsal spine is not so thickened (fig. 24d); also the middle femur lacks long fine hairs on the dorsal surface (fig. 24c). In other respects this is very much like *distortipes*. The antennae are yellow, the third segment is two times longer than wide, slightly pointed at apex; the thorax is almost entirely yellow with two or three faintly brown vittae down the mesono-

tum. The posterior margins of the sterna and the posterior lateral margins of the terga are often yellow.

Length: body, 2.25 mm.; wings, 3.00 mm.

FEMALE. The female has not previously been reported. It is much like the male except that the third antennal segment is as wide as long, rounded at apex, slightly brown on the dorsal surface. Also the sides of the eyes are separated on the face by about one row of eye facets rather than being approximately continuous as in the male.

***Campsicnemus mirabilis* (Grimshaw), new combination** (fig. 24e-f).

Emperoptera mirabilis Grimshaw, 1902, Fauna Hawaiiensis 3 (2) :81.

Endemic. Oahu (type locality: Koolau Range "back of Malukia," four specimens taken on *Freycinetia*, December, 1900). Known only from the type series; numerous searches have been made for this species throughout the Koolaus but it has not been retaken. Type in the British Museum (Natural History). Three specimens (two females, one male) are in the British Museum collection; all glued together on one card, they are in fairly good condition but the characters are difficult to discern because of the way they are glued down. The senior author studied these specimens and the following notes are based upon them.

This species is easily distinguished by the highly polished black mesonotum and front and by the very narrow wings and the strong bristle at the apex (fig. 24e). Head entirely black except for the red eyes, the front and upper occiput are polished blue-black. The eyes of the male are contiguous on the face. In the female the face is brown pubescent on the upper half and densely silvery-white on the lower half, the upper portion is strongly narrowed, scarcely wider than two eye facets; the lower portion very slightly gibbose. I see no evidence of bristles on the front. The ocellar and vertical bristles are extremely strong, their length is comparable to the width of the front at the vertex. The antennae are broken on two of the specimens and are not clearly visible on the third. The first two segments appear to be black, the third is brown, cone-shaped, rather sharply pointed at apex and about two times longer than its greatest width; the entire third segment is densely covered with short black hairs. The arista apparently is covered with very short pubescence. Mesonotum entirely polished blue-black, scutellum brown on the disc, yellow on the margins. The thoracic bristles have been broken on most of the specimens; one specimen possesses a pair of strong presutural dorsocentrals on each side and one pair of anterior supraalar bristles, also one pair of very strong scutellar bristles. One specimen also appears to have a strong, probably posthumeral, bristle on each side and another very strong, probably notopleural, bristle. The sides of the mesonotum seem to be developed more ventrad than is normal, the lateral margins extend approximately level with the basal portion of the wing; there is also no evidence of a notopleural callus in the normal position; also no distinct humeral callus is present on these specimens. The scutellar bristles are elongate, extending to the apex of the second

abdominal segment. There is no evidence of halteres on these specimens; these are either broken off or they may be rudimentary in this species. The wings are extremely narrow; only one vein is developed, probably the radial, and this seems to extend all the way to the wing tip (fig. 24e). Legs entirely yellow; in the male the tibiae each have one posterior bristle, one strong dorsal bristle at basal one-sixth, and one weak preapical; the anterodorsal surface has one moderately strong bristle at apical third. The anterior surface has two rows of rather strong, erect setae just before the apex. In the female there are four rather strong anterior bristles on the middle tibia. The middle basitarsus of the male has a strong apical spine on anterior dorsal surface (fig. 24f). The abdomen is predominantly shining dark reddish brown to black, the basal segment is almost entirely yellow, and the apical portion only is discolored with brown.

Length: body, 1.5 mm.; wings, 1.1 mm.

***Campsicnemus miritibialis* Van Duzee (fig. 25 d-e).**

Campsicnemus miritibialis Van Duzee, 1933, Proc. Haw. Ent. Soc. 8:330, figs. 80-83.

Endemic. Oahu (type locality: Waihi iki, Manoa, Honolulu, on running water). A very active water skater on the running streams of the Koolau Mountains.

Type in the Hawaiian Sugar Planters' Association collection.

Williams, in the preface to Van Duzee's paper (1933:308), says, "These insects employ the middle pair of legs and their wings in propelling themselves in their sometimes almost invisibly swift graceful gyrations on the surface of the water. They travel over a more or less regular 'beat' or restricted area of water and, when two flies meet, there is usually an extremely rapid scuffle for a moment. Such a beat is usually where there is a gentle current, being frequently near the head of a little pool or below a small rapids, and the flies maintain their place—when not dashing about—by regular strokes of the middle pair of legs and flicking of the wings. Patrolling thus with speed and alertness, they are able to capture the large and active collembolan, *Salina maculata* Folsom (Proc. Haw. Ent. Soc. VIII, No. 1, p. 71, figs. 105-110, 1932) that is abundant about the haunts of *C. miritibialis* and is occasionally seen on the water, and that at least at times must form one of the chief foods of this fly."

Fitting in the group of species which has the basitarsus of middle legs short and armed with a large black apical spur and which has a projection developed on anterior surface at apical third of middle tibia. It fits closest to *C. ridiculus* Parent, but it is differentiated by its much larger size, more robust dark body and legs, and by the shorter antennae and very differently developed middle legs (fig. 25d-e).

Entirely brown to black species, often with a yellow tinge on the front coxae and bases of femora, also the stems of halteres yellow. Third antennal segment triangular, about as wide as long. All femora with numerous hairs or hair-like

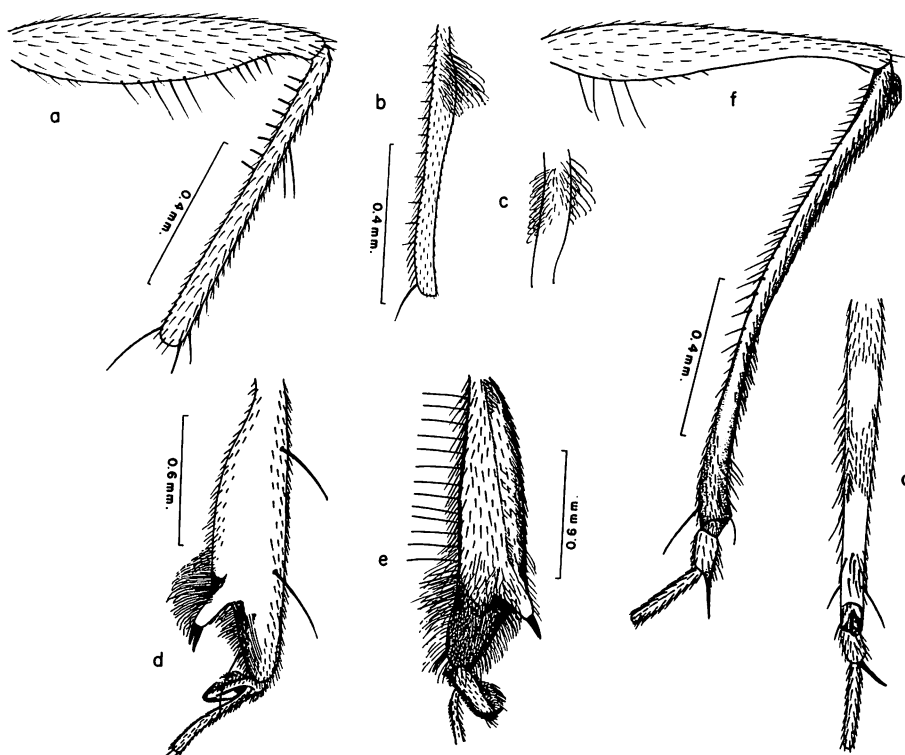


Figure 25—*Campsicnemus miser* Parent: a, middle femur and tibia, anterior view. *C. miritibialis* Van Duzee: d, middle tibia, dorsal view; e, middle tibia, ventral view. *C. modicus* n. sp.: b, middle tibia, anterior view; c, basal portion of middle tibia, dorsal view. *C. mucronatus* n. sp.: f, middle femur, tibia, and basal two tarsal segments, anterior view; g, apical half of middle tibia and basal two tarsal segments, dorsal view.

bristles on the ventral surface. Middle femur not noticeably swollen. Middle tibia strongly swollen, densely covered with long fine hairs on ventral surface at apical half and with a strong projection on anterior surface, which bears two stout, blunt spines at its apex (Van Duzee, figure 82, showed this projection as a forked process). Middle basitarsus flattened dorsoventrally, with a strong spine on the anterodorsal surface and with the second tarsal segment inserted near the base of the segment (fig. 25d). Wings light brown fumose.

Length: body, 2.5–2.8 mm.; wings, 3.5–4.0 mm.

***Campsicnemus miser* Parent (fig. 25a).**

Campsicnemus miser Parent, 1939, Proc. Haw. Ent. Soc. 10:230, fig. 14.

Endemic. Oahu (type locality: Mt. Olympus).

Type in the Hawaiian Sugar Planters' Association collection.

Fitting in the group of species which has the middle tarsus without ciliation,

the basitarsus simple and slender, the middle tibia simple, sparsely bristled and lacking blunt posteroventral bristles. It is related to *C. flavipes* n. sp. but the blunt posteroventral bristles of the middle tibia are shorter, about equal in length to width of tibia; the middle tibia is straight and has two strong dorsal bristles, and the arrangement of the bristles of the middle femur is very different, as shown in figure 25a.

The eyes are very narrowly separated on the middle of the face. At the narrowest part the face is about one-half as wide as one eye facet. Upper portion of thorax polished brown in ground color, rather densely covered with brown pollen, the median portion with a distinct greenish or coppery sheen. The upper half of each pleuron is yellow-brown, the lower portion is clear yellow. Middle femur moderately swollen with a row of seven or eight strong, posteroventral bristles extending from near middle to about apical sixth of segment. Middle tibia straight, with a strong anterodorsal bristle at basal third and with a strong dorsal bristle just beyond the anterodorsal. Posteroventral surface with a row of blunt bristles extending from about the basal one-sixth to almost the middle of the segment. Anteroventral surface with a row of suberect setae extending almost the entire length of the segment. Middle basitarsus two-thirds longer than second tarsal segment and about two-fifths as long as tibia. Wings very lightly fumose. Fifth costal section slightly longer than fourth.

Length: body, 1.7 mm.; wings, 2.1 mm.

Campsicnemus modicus Hardy and Kohn, new species (figs. 25b-c; 35 b and d).

Fitting in the group of species which lacks ciliation on the middle tarsus and with the middle basitarsus slender and the middle tibia with a dense clump of fine hairs at basal third (fig. 25b). It is closest to *C. setiger* n. sp. but differs by having the dorsal surface of front femur blackened; the anteroventral surface of hind femur lacking distinct bristles (fig. 35d); the posteroventral bristles of middle femur extending to about middle and anteroventral setae extending to about apical two-fifths (fig. 35b).

MALE. Small dark-bodied species. *Head*: Eyes contiguous on the front for a distance equal to about four rows of eye facets. Antennae yellow, third segment subobtusate, slightly less than half longer than wide. *Thorax*: Dark brown to black, gray-brown pollinose on the dorsum. Four pairs of dorsocentral bristles present, the third pair moderately small. No acrostichals present. Halteres clear yellow. *Legs*: Yellow except for brown middle coxa, for dark brown to black dorsal surface of front femur, and slightly discolored dorsal surface of hind femur; also, the tarsi are tinged with brown. Middle femur rather slender, with about six rather strong posteroventral bristles extending from about basal fourth to apical middle of segment. Middle tibia almost straight, the dense clump at basal third has the longest hairs concentrated on the antero- and posterodorsal surfaces. Middle basitarsus slender, nearly two times longer than second segment and about three-fifths as long as tibia. Hind femur lacking distinct anteroventral bristles

but with a row of erect yellow-brown hairs along this surface; the longest of these is about one-third the width of the segment. *Wings*: Slightly dusky. The fourth costal section is a little longer than fifth. Last section of M_{3+4} three times longer than m crossvein. *Abdomen*: Entirely black, about as long as the thorax. The genitalia have not been relaxed for study.

Length: body, 1.55 mm.; wings, 2.20 mm.

FEMALE. The females have not been associated with the males.

Holotype male: Keanakolu, Hawaii, 5,200 ft., October, 1952 (D. E. Hardy). Twenty-three male paratypes, mostly same data as type, and one specimen each from the following localities on Hawaii: Kaiholena, August, 1952 (D. E. Hardy); Upper Olaa Forest, August, 1952 (W. C. Mitchell); and Kulani, 5,200 ft., July, 1952 (D. E. Hardy). A series of females are on hand from the same localities but since they cannot be associated with the males, they are not being designated as paratypes.

Type and some of the paratypes in the B. P. Bishop Museum. Remainder of the paratypes distributed among the following collections: U. S. National Museum, British Museum (Natural History), Hawaiian Sugar Planters' Association, State Department of Agriculture, and the University of Hawaii.

***Campsicnemus mucronatus* Hardy and Kohn, new species (fig. 25f-g).**

Fitting in the group which has the middle basitarsus short and armed with a black apical spur and the middle tibia flattened dorsoventrally and arcuate. It is related to *C. petalictenus* n. n. but differs by having the middle tibia rather gently arcuate, not densely haired on dorsal surface and not so strongly flattened, scarcely over half as wide as the femur; also the middle tibia has no clump of peg-like setae before apex, and the spur of the middle basitarsus is sharp-pointed, bristle-like (fig. 25f).

MALE: Head: Eyes contiguous on the face for a distance equal to about four rows of eye facets. Upper and lower portions of face yellow-brown pubescent. Front and vertex metallic black in ground color, covered with brown pollen. First two antennal segments yellow, third segment yellow-brown, rounded at apex, about as wide as long. **Thorax**: Mesonotum and scutellum brown, tinged with yellow around the margins, rather thickly dusted with brown pollen but shining in direct light. Four pairs of dorsocentral bristles present and three to five small inconspicuous acrostichals arranged in a single row on front portion of mesonotum. Upper portions of pleura yellow, tinged with brown, lower portions clear yellow. Halteres yellow. **Legs**: Predominantly yellow. Each front and hind femur with brown discoloration extending over the apical half on dorsal surface. Middle coxa tinged with brown. Tarsi largely brown. Front femur devoid of ventral bristles except for a row of about six short posteroventrals just before apex. Front tibia short and rather thick, with several rows of short erect cilia extending the entire length on the dorsal surface. First two tarsal segments of front legs with a row of moderately long cilia extending down posterior sur-

face; these are approximately equal in length to width of the tarsus; the first tarsal segment is about four-fifths as long as the tibia. Middle femur moderately swollen on basal three-fifths, attenuated apically, almost devoid of ventral bristles except for about four, moderately long posteroventrals at basal one-third, and four or five short, inconspicuous posteroventral setae near middle of segment, all of the ventral setae brownish yellow in color. Middle tibia gently arcuate, slender, about two-fifths longer than tarsus, flattened dorsoventrally; dorsal surface with a row of short anterodorsal and posterodorsal bristles extending the entire length of segment; the median portion with only a small clump of black bristles near base and a few scattered black bristles just before apex of segment. Posteroventral surface with a row of erect black bristles extending over basal half of segment. Middle basitarsus short, about one-third as long as second tarsal segment. The apical spur is rather slender and sharp-pointed (fig. 25g). The dorsal surface of the tibia is not conspicuously haired except for the clump near base and a clump of scattered setae just before apex and except for the sides. The median portion has short, inconspicuous hairs on about the basal half of the segment. The hind femur has a row of short anteroventral setae extending from near basal one-fourth to apex of segment. *Wings*: Dusky fumose. Fourth costal section one-third to one-half longer than fifth. Veins R_{4+5} and M_{1+2} parallel. Last section of M_{3+4} about three and a half times longer than m crossvein. *Abdomen*: Subopaque, dark brown to black, lightly covered with gray-brown pollen. The genitalia have not been relaxed for study.

Length: body, 1.85 mm.; wings, 2.25 mm.

FEMALE. Similar to the male except for secondary sexual characters; also, the mesonotum is often more yellow-brown. The face is gray pubescent and at its narrowest point is about equal in width to one eye facet.

Length: body, 1.85 mm.; wings, 2.40 mm.

Holotype male and allotype female: Waikamoi, Maui, 4,000 ft., July, 1956 (D. E. Hardy). Thirty paratypes (20 males and 10 females): same data as type (D. E. Hardy and R. Namba).

Type, allotype, and a series of paratypes in the B. P. Bishop Museum. Remainder of paratypes in the following collections: U. S. National Museum, British Museum (Natural History), Hawaiian Sugar Planters' Association, State Department of Agriculture, and University of Hawaii.

***Campsicnemus mundulus* Hardy and Kohn, new species (fig. 26a).**

Fitting in the group of species which has the middle basitarsus shorter than second segment and with a spur at apex. It runs near *C. congregatus* Malloch and *putillus* Parent. It is very different from either of these species. The middle femur lacks bristly hairs on anterodorsal surface, the middle basitarsus is longer, and the spur is more poorly developed (fig. 26a). It also differs in many other details.

MALE. *Head*: Face gray pubescent. Eyes narrowly separated on the face by a

distance equal to one row of eye facets. Front and vertex black, covered with gray-brown pollen. Antennae yellow, third segment tinged with brown at the apex, triangular in shape, about half longer than wide. *Thorax*: Largely yellow, with a broad brown to black vitta down each side of mesonotum; metapleura and sides of metanotum brown to black. Four pairs of strong dorsocentral bristles present, in addition to a pair of poorly developed bristles near the anterior margin; acrostichal setae well developed and arranged in one row. *Legs*: Largely yellow. All segments slender. Front femur devoid of ventral bristles. Front tibia with one dorsal bristle situated just before the middle. Front basitarsus three-fourths as long as tibia. Middle femur with a row of moderately developed posteroventral and a row of rather small anteroventral bristles extending the entire length of the segment. Middle tibia long, slender, and straight; posteroventral surface with moderately long, erect bristles extending almost to the apex; anterodorsal surface with a row of long, hooked cilia extending from near base to just beyond middle; and anterior surface with numerous long, pale cilia on basal half of segment. Middle basitarsus as described above, spur short and straight (fig. 26a). Hind femur lacking ventral bristles except for a small bristle on each side just before apex. Four anterodorsal bristles on hind tibia, one near basal fourth, one at basal two-fifths, one at apical third, and one just before the apex; dorsal surface with five bristles, one just beyond base, one at basal two-fifths, one at about middle, one near apical fourth, and one just before the apex. *Wings*: Lightly fumose. Fourth costal section nearly two times longer than fifth. Apical portions of veins R_{4+5} and M_{1+2} slightly convergent. Last section of vein M_{3+4} two and one-third times longer than m crossvein. *Abdomen*: Brown to black, covered with gray pollen; slightly shining in direct light.

Length: body, 2.6 mm.; wings, 3.3 mm.

FEMALE. Unknown.

Holotype male: Waikamoi, Maui, 4,000 ft., July, 1956 (R. Namba).

Type in the B. P. Bishop Museum.

***Campsicnemus nambai* Hardy and Kohn, new species (fig. 26b-c).**

Fitting in the group of species which possesses a distinct process near base of each middle tibia, and which has the middle tibia slender and not strongly curved (fig. 26b). It fits near *C. flavithorax* n. sp. by having the middle femur constricted at apex and the middle tibia with truncate posteroventral bristles. It is distinguished from *flavithorax* by having a row of long hair-like anterior bristles on apical half of middle tibia and lacking anterior bristles on basal portion of segment; also the middle femur has only two strong ventral bristles near middle of segment and the front tibia lacks a dorsal bristle.

MALE. Rather small, predominantly yellow species. *Head*: Eyes joined on face for a distance equal to about three eye facets. Lower portion of face yellow-gray pubescent. Front and vertex metallic blue-green, rather lightly dusted with gray pollen. Antennae predominantly yellow, third segment slightly tinged with

brown and pointed at apex, almost two times longer than wide. *Thorax*: Yellow except for a darkened area between the dorsocentral rows, usually with a dark line extending down each dorsocentral row and down the acrostichal row and diffusing together posteriorly to cover the entire area between the last two dorsocentrals. This darkened area is metallic green in direct light. Each metapleuron has a black spot on the front portion. The halteres are yellow. *Legs*: Entirely yellow except for slight discoloration of brown on outside surface of middle coxa. Front femur devoid of conspicuous ventral bristles. Front tibia lacking a dorsal bristle. Front basitarsus about three-fifths as long as tibia. Middle femur slender, strongly constricted at apex, and with a small anteroventral bump produced just behind the constriction (fig. 26b); ventral surface with two strong and several weak bristles arranged near middle of segment and with a row of short black bristles just before the constriction. Middle tibia as described above and as in figure 26c, the truncate posteroventral bristles extend to about middle of segment. Middle basitarsus slightly over half the length of the tibia and two times longer than the second tarsal segment. Hind femur devoid of distinct ventral bristles. *Wings*: Faintly fumose. Fourth costal section about one-half longer than fifth. Apices of veins R_{4+5} and M_{1+2} slightly diverging. Last section of vein M_{3+4} about three times longer than m crossvein. *Abdomen*: Yellow on the sides and on the venter, first tergum predominantly yellow, brown at apical median portion. The sixth tergum yellow, other visible terga predominantly brown on dorsal portions. Genitalia yellow.

Length: body, 1.30–1.50 mm.; wings, 1.85–2.00 mm.

FEMALE. Similar to the male except for secondary sexual characters. The face is entirely gray pubescent and the eyes are separated by about two rows of eye facets. The third antennal segment is rounded, about as wide as long. A rather broad dark vitta extends down the mesonotum, in the area from the dorsocentrals to the inner alar bristles, this is not connected posteriorly. No median vitta is present on the mesonotum.

Length: body, 1.50 mm.; wings, 2.25 mm.

Holotype male, allotype female, and one paratype male: Waikamoi, Maui, 4,000 ft., July, 1956 (R. Namba).

Type and allotype in B. P. Bishop Museum. Paratype in the U. S. National Museum.

***Campsicnemus nigricollis* Van Duzee (fig. 26d).**

Campsicnemus nigricollis Van Duzee, 1933, Proc. Haw. Ent. Soc. 8:320, figs. 33–36.

Endemic. Kauai (type locality: Kokee, 3,500 ft. "active water skater"). A series is on hand from Alakai Swamp, Kauai.

Type in the Hawaiian Sugar Planters' Association collection.

An entirely brown to black species fitting in the group which has no projec-

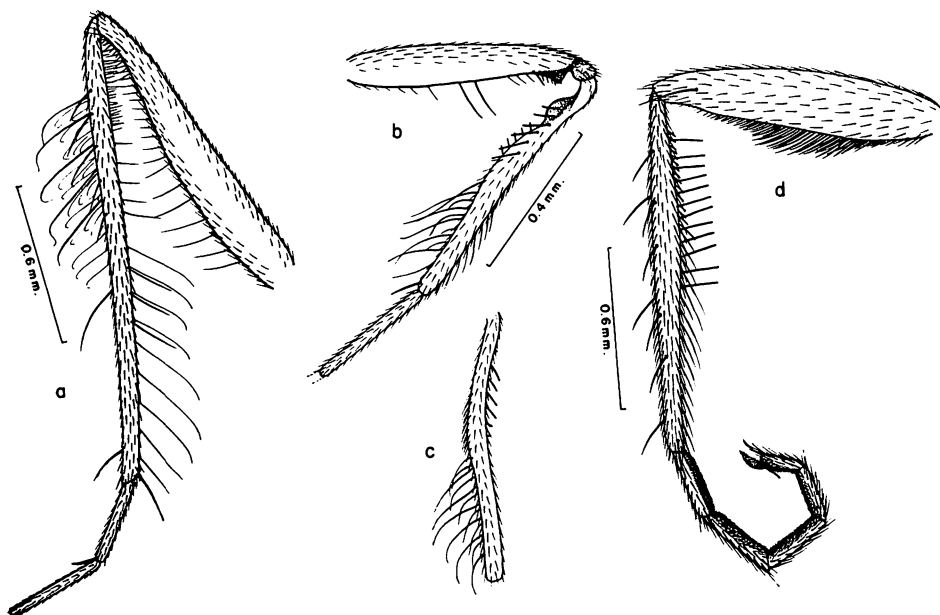


Figure 26—*Campsicnemus mundulus* n. sp.: a, middle femur, tibia, and basal two tarsal segments, anterior view. *C. nambai* n. sp.: b, middle femur, tibia, and basitarsus, posterior view; c, middle tibia, dorsal view. *C. nigricollis* Van Duzee: d, middle leg, anterior view.

tion on middle tibia and the middle basitarsus shorter than the second tarsal segment but lacking a flat apical lobe on the basitarsus. It fits near *C. longitibia* n. sp., from Molokai but is much larger, the male legs are entirely dark colored, five pairs of dorsocentral bristles are present, and the bristling and development of the legs is entirely different, as shown in figure 26d.

Third antennal segment as wide as long, the arista basal. Mesonotum and scutellum opaque black, faintly metallic blue-green in direct light, especially in the median portion. One row of rather well-developed acrostichals extend almost the entire length of the mesonotum. Front and hind femora each with a row of anteroventral and posteroventral bristles extending the entire length of the segment. Each middle femur densely covered with short bristles on the ventral surface. Each middle tibia with a row of thin, blunt, anteroventral bristles extending the entire length and with five or six rather strong, stout, anterodorsal bristles (fig. 26d). Middle basitarsus about two-thirds as long as second segment.

Length: body, 2.6 mm.; wings, 3.3–3.5 mm.

For a more complete description of the male refer to the original.

FEMALE. The female has not previously been reported. It is similar to the male except that the front coxae and all femora are distinctly tinged with yellow.

Length: body, 2.2–2.4 mm.; wings, 3.3 mm.

Campsicnemus nigroanalisis Parent (fig. 27a).

Campsicnemus nigroanalisis Parent, 1939, Proc. Haw. Ent. Soc. 10:230, fig. 15.

Endemic. Oahu (type locality: Mt. Olympus). Known only from Mt. Olympus.

Type in the British Museum (Natural History). One male and one female labeled cotype "olympus" in the Museum National d'Histoire Naturelle, Paris.

Fitting in the group of species with a short midbasitarsus with a strong spine at apex. Differing from other species in this complex by having just three pairs of dorsocentral bristles and no acrostichals; middle tibia with two dorsal bristles, one at basal sixth, and one at middle; also with one anterior bristle on apical one-sixth.

A small, predominantly yellow species. Antennae reddish yellow, tinged with brown on apical segment, apical segment pointed, about one-half to two-thirds longer than wide; arista sub-basal. Body and legs entirely yellow except that the tip of the abdomen and the metapleura are brown. Wings hyaline. Fifth costal section as wide as fourth. The front femur is devoid of ventral bristles, the hind femur has a row of moderately developed anteroventrals. The middle femur is rather thickly covered with short, black bristles over the apical three-fifths of the ventral surface, and with two rather strong anteroventral bristles near base. The middle tibia is thickest at its basal two-fifths and has numerous erect ventral bristles extending from base to about apical third in addition to the bristles mentioned above (fig. 27a). Middle basitarsus very short; excluding the apical spine it is scarcely one-sixth as long as the second tarsal segment.

Length: body, 1.3–1.5 mm.; wings, 1.9 mm.

Campsicnemus norops Hardy and Kohn, new species (fig. 27b).

Fitting in the group of species with a simple slender middle basitarsus and resembling *C. ornatus* Van Duzee because of its metallic green coloration. It is distinguished from this species by having only three pairs of dorsocentral bristles, by the front tibia having a distinct dorsal bristle near basal two-fifths, and the middle tibia with blunt ventral bristles on basal half.

MALE. A small, predominantly metallic species. *Head*: Eyes contiguous on the face for a distance of two or three eye facets, lower portion of face yellow-brown pubescent. Front and vertex metallic blue-green, lightly dusted with brown. Antennae yellow. Third segment subacute, about one-half longer than wide. *Thorax*: Metallic green, lightly dusted with yellow-brown pollen on the dorsum, gray on the sides. Three pairs of strong scutellar bristles and a few acrostichals present. Halteres clear yellow. *Legs*: Entirely yellow. Front femur slender, devoid of ventral bristles. Dorsal bristle of middle tibia yellow-brown, about one-third longer than width of tibia. Middle femur slender, attenuated at apex and with a small lobate process developed on anteroventral surface at about apical fifth of segment; rather strong ventral bristles are present from about the basal two-fifths to apical one-

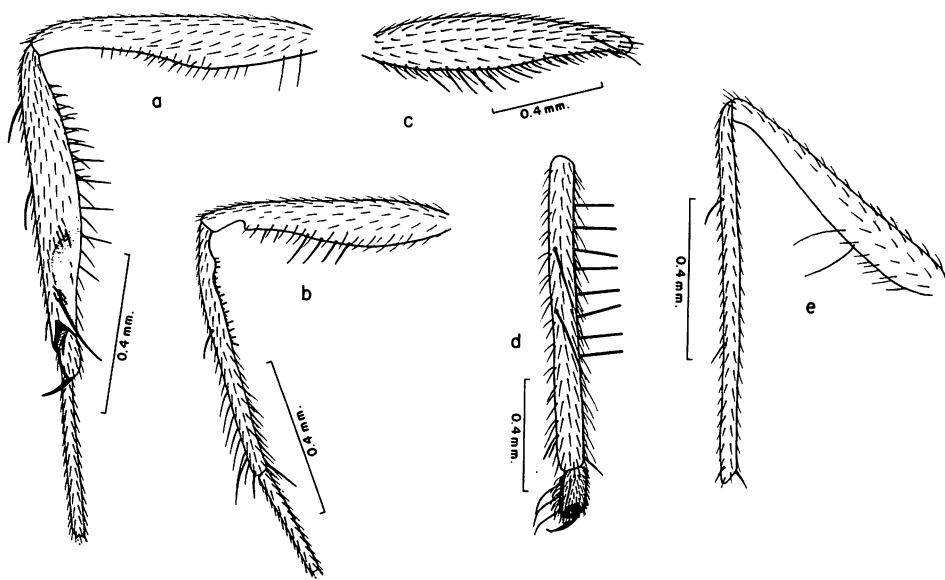


Figure 27—*Campsicnemus nigroanalisis* Parent: a, middle femur, tibia, and basitarsus, anterior view. *C. norops* n. sp.: b, middle femur, tibia, and basitarsus, anterior view. *C. obscurus* Parent: c, middle femur, anterior view; d, middle tibia and basitarsus, posterodorsal view. *C. olympicolus* Parent: e, middle femur and tibia, anterior view.

fifth of segment. Several of these are arranged on the posteroventral surface and several are on the anteroventral surface, also a number of small erect hairs extend to the base of the segment (fig. 27b). Middle tibia slender, with a row of blunt posteroventral bristles extending over the basal half of the segment. Middle basitarsus slender, nearly two times longer than second tarsal segment and about half as long as tibia. Hind legs slender, femur devoid of ventral bristles except for one or two at the extreme apex. *Wings*: Hyaline. Fourth costal section just slightly longer than fifth. Last section of M_{3+4} two and one-half times longer than m crossvein. *Abdomen*: Entirely black, distinctly metallic green or coppery on the dorsum. The genitalia have not been relaxed for study.

Length: body, 1.30 mm.; wings, 1.85 mm.

FEMALE. Unknown.

Holotype male: Alakai Swamp, Kauai, 3,800 ft., August, 1952 (D. E. Hardy).

Type in the B. P. Bishop Museum.

***Campsicnemus obscurus* Parent (fig. 27c-d).**

Campsicnemus obscurus Parent, 1938, Konowia 16:78, figs. 11-12.

Endemic. Molokai (type locality: Moaula Stream, 2,100 ft., on water—misspelled "Moalua" in the original description and on the type). Known only from the type locality.

Three cotypes (two males, one female) in the Parent collection at the Museum National d'Histoire Naturelle, Paris; the type is evidently one of these male specimens but it has not been designated. Allotype female and two male cotypes in Hawaiian Sugar Planters' Association collection.

Fitting in the group of species which has the middle basitarsus short and armed with an apical spine. It differs from related species by having five pairs of dorsocentral bristles, all femora with ventral ciliation and the middle tibia straight with two dorsal bristles and a row of erect blunt ventral bristles on basal two-thirds (fig. 27d).

A moderately small, entirely dark-colored species. Third antennal segment slightly wider than long, rounded at apex. Legs brown, tinged slightly with rufous or yellow. All femora with ventral bristles extending their entire length (fig. 27c). Middle tibia as mentioned above and as in figure 27d. Middle basitarsus about one-third as long as second segment. The entire tarsus very densely pale pilose on the ventral surface. Mesonotum and scutellum dark brown with a faint bluish tinge in the ground color.

Length: body, 1.70–2.00 mm.; wings, 2.75 mm.

***Campsicnemus olympicolus* Parent (fig. 27e).**

Campsicnemus olympicola Parent, 1939, Proc. Haw. Ent. Soc. 10:231.

Endemic. Oahu (type locality: Mt. Olympus, on ground, 2,000 ft.).

Type in the British Museum (Natural History). Topotypic specimens (these probably are cotypes) are in the Hawaiian Sugar Planters' Association collection from the type locality and from Konahuanui Trail, Oahu, 2,000 ft. The data on these fit those recorded by Parent in the original.

Fitting in the group of species which lacks ciliation on middle tarsi, which has the basitarsus simple and slender, the middle tibia straight, and sparsely bristled, and which has no dorsal bristle on the front tibia. It closely resembles *C. deficiens* Parent but apparently differs by having no dorsal bristle on middle tibia and by having the halteres and apical two-fifths of the hind femora brown.

A small, sparsely bristled species. The basal segments of the antennae are yellow, the third segment is yellow-brown, sharp-pointed, and about one-half longer than wide. Thorax brown, tinged with yellow. Mesonotum rather densely yellow-brown pollinose. Three pairs of dorsocentrals and no acrostichals present. Middle femur slender, with two moderately strong yellow-brown anteroventral bristles at middle of segment. Middle tibia straight and slender, devoid of bristles or long hairs except for three anterodorsal bristles and for one ventral bristle at apex. Legs entirely yellow. Wings light brown fumose over the anterior half, posterior portion more dusky fumose. Fourth costal section nearly two times longer than fifth. Last section of M_{3+4} three times longer than m crossvein.

Length: body, 1.2–1.5 mm.; wings, 1.8–2.0 mm.

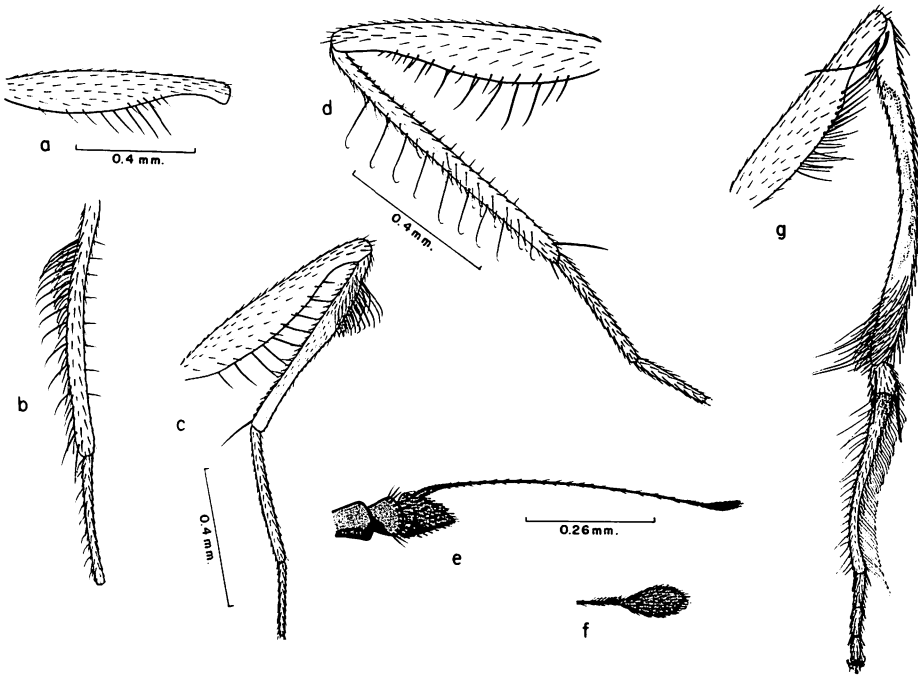


Figure 28—*Campsicnemus ornatus* Van Duzee: a, middle femur, anterior view; b, middle tibia and basitarsus, dorsal view. *C. paniculatus* n. sp.: c, middle femur, tibia, and basal two tarsal segments, anterior view. *C. parvulus* n. sp.: d, middle femur, tibia, and basal two tarsal segments, anterior view. *C. patellifer* Grimshaw: e, antenna; f, apex of arista; g, middle leg, anterior view.

***Campsicnemus ornatus* Van Duzee (fig. 28a–b).**

Campsicnemus ornatus Van Duzee, 1933, Proc. Haw. Ent. Soc. 8:323, figs. 43, 44.

Campsicnemus strigosus Van Duzee, 1933, Proc. Haw. Ent. Soc. 8:326, figs. 52–54. (type male, from “Waiawa” [this evidently should be Wahiawa], Oahu, Hawaiian Sugar Planters’ Association collection).

Endemic. Oahu (type labeled “Oahu?”).

Van Duzee said “This specimen was one of several that were glued on strips of paper and had become detached, so I cannot be sure on which Island it was taken.” This is a common species on foliage, usually in the sun in the Mt. Tantalus region, Koolau Range, Oahu.

Type in the Hawaiian Sugar Planters’ Association collection.

Fitting in the group of species which has the middle basitarsus slender, about two times longer than second segment. Differing from all other known Hawaiian species by the bright metallic green coloration of mesonotum, front, and vertex.

Lower portion of pleura, all of humeri, and legs yellow. Antennae yellow

except for a brown tinge around margin of third segment, third antennal segment slightly rounded at apex, about one-half longer than wide. Front basitarsus slender, curved, over two times longer than second tarsal segment and four-fifths as long as tibia. Middle femur rather slender, ventral bristles arranged from near basal two-fifths to apical one-fourth. Middle tibia slender, almost straight, anterior surface with a dense clump of slender, yellow-brown hairs extending from near middle to near base of segment, these curved at apices; with two rows of shorter brown bristle-like hairs extending to apex of segment; also with a row of moderately strong erect posterior bristles extending from apical two-fifths to near base of segment. Middle basitarsus slender, about two times longer than second segment, and with moderately developed, suberect ciliation on the first two or three segments. For further details refer to the original description and to figure 28a-b.

Length: body, 1.70 mm.; wings, 2.25 mm.

***Campsicnemus pallidus* Parent.**

Campsicnemus pallidus Parent, 1939, Proc. Haw. Ent. Soc. 10:232.

Endemic. Oahu (type locality: Mt. Olympus, 2,200 ft.).

Type in the Hawaiian Sugar Planters' Association collection.

Based upon one female specimen which supposedly differed from other species by its all-yellow color. This is probably the female of *C. inermipes* Malloch, *C. congregatus* Malloch, or possibly one of the other all-yellow species; it is impossible to place it without the male.

***Campsicnemus paniculatus* Hardy and Kohn, new species (fig. 28c).**

Fitting in the group of species which lacks ciliation on middle tarsi, has the basitarsus slender, and which has a dense clump of setae on basal third of middle tibia. It is differentiated from related species by lacking bristles or bristle-like hairs on anteroventral surface of hind femur.

MALE. Rather small, dark-bodied species. *Head:* Eyes joined on face for a distance of about four rows of eye facets. Antennae mostly yellow, third segment tinged with brown, subobtuse at apex and about one-third longer than wide. *Thorax:* Brownish gray pollinose on mesonotum. Four pairs of dorsocentral bristles, the third moderately developed. No acrostichals present. Halteres bright yellow. *Legs:* Largely yellow, middle coxa brown. Front and hind legs without unusual bristles. Middle femur moderately slender with four rather strong posteroventral bristles arranged from basal third to just beyond middle of segment, with two slender hair-like ventral bristles near base of segment, and a row of three smaller black ventral bristles extending from end of posteroventrals to apical third of segment. Anteroventral surface with small erect setae extending over most of the length. Middle tibia straight, basal fourth densely covered with fine ciliation; the longest hairs are on the antero- and posterodorsal surfaces

with abundant short hairs between (fig. 28c). Middle basitarsus slender, two-thirds longer than second segment and about half as long as tibia. *Wings*: Almost hyaline. Fourth costal section slightly shorter than fifth. Last section of M_{3+4} three times longer than m crossvein. *Abdomen*: Entirely black, very short and compact, not as long as thorax. The genitalia have not been relaxed for study.

Length: body, 1.6 mm.; wings, 2.2 mm.

FEMALE. The female has not been associated with the male.

Holotype male: Upper Olaa Forest, Hawaii, August, 1952 (W. C. Mitchell). Four male paratypes: same data as type, August, 1952, and July, 1953 (W. C. Mitchell and D. E. Hardy).

Type in the B. P. Bishop Museum. Paratypes in the following collections: U. S. National Museum, British Museum (Natural History), and the University of Hawaii.

Campsicnemus parvulus Hardy and Kohn, new species (fig. 28d).

Fitting in the group which lacks ciliation on middle tarsi and with the middle basitarsus slender, which has no dorsal bristle on front tibia or on basal half of middle tibia, and which has long fine ciliation along anterodorsal surface of middle tibia. It fits closest to *C. hispidipes* but differs by having just one row of moderately spaced hairs along anterodorsal surface.

MALE. A small, dark-bodied species. *Head*: Eyes joined on the face for a distance equal to about four rows of eye facets. Upper and lower portions of face gray pubescent. Front and vertex black, covered with gray pollen. Two basal segments of antenna yellow; third segment brown, tinged with yellow at its base, subacute, about one-half longer than wide. *Thorax*: Black, rather densely gray pollinose. Four pairs of dorsocentrals and no acrostichal setae present. *Legs*: Almost entirely yellow. Front femur lacking ventral bristles. Front basitarsus slender, three times longer than second segment and three-fourths as long as tibia. Middle femur moderately swollen, with about ten rather well-developed ventral bristles extending from near base to about apical third of segment. Middle tibia straight, rather slender, with one row of long hairs extending down anterodorsal surface and a row of short erect setae down posteroventral surface. Middle basitarsus about one-third as long as tibia (fig. 28d). Hind femur with moderately developed anteroventral bristles extending over the median portion of the segment, the longest of these slightly over half the width of the femur. *Wings*: Dusky fumose. Fourth costal section just slightly longer than fifth. Last section of M_{3+4} three times longer than m crossvein. *Abdomen*: Entirely black, gray pollinose, about equal in length to thorax. The genitalia have not been relaxed for study.

Length: body, 1.4–1.6 mm.; wings, 2.0–2.3 mm.

FEMALE. Similar to the male except for the bristling on the legs. The nar-

rowed portion of the face is almost as wide as one row of eye facets. The third antennal segment is rounded, as wide as long.

Type male and allotype female: Kahuku Ranch, Hawaii, 3,000 ft., July, 1953 (D. E. Hardy). Seventy-two paratypes, predominantly males, from the following localities on Hawaii: same as type; Oloa Flume Road, July, 1953 (D. E. Hardy); Bird Park, Kilauea, Hawaii National Park, July, 1953 (D. E. Hardy); Kaiholena Ridge, August, 1952, 2,300 ft. (D. E. Hardy); Upper Oloa Forest, August, 1953 (W. C. Mitchell); Keanakolu, 5,200 ft., October, 1952 (D. E. Hardy); and Kaiholena, Kohala Mts., 4,000 ft., August, 1952 (D. E. Hardy).

Type, allotype, and a series of paratypes in the B. P. Bishop Museum. Remainder of paratypes distributed among the following collections: U. S. National Museum, British Museum (Natural History), Hawaiian Sugar Planters' Association, State Department of Agriculture, and the University of Hawaii.

***Campsicnemus patellifer* Grimshaw (fig. 28e-g).**

Campsicnemus patellifer Grimshaw, 1902, Fauna Hawaiiensis 3 (3):80.

Campsicnemus nudifemorata Van Duzee, 1933, Proc. Haw. Ent. Soc. 8:332, figs. 88-89.

Endemic. Oahu (type locality: "Pali"). This is one of the most common species on the ground litter in the mountains on Oahu.

Type in British Museum (Natural History). Type of *nudifemorata* in the Hawaiian Sugar Planters' Association collection.

Fitting in the group of species which lacks a projection on the middle tibia, which has the middle basitarsus distinctly shorter than second tarsal segment and armed with a large black apical spur. It is distinguished from all other species of *Campsicnemus* in Hawaii by its capitate arista (fig. 28f). The elongate second tarsal segment of middle leg is also distinctive (fig. 28g).

A rather small, black-bodied, submetallic species. Third antennal segment slightly longer than wide, triangular. Arista basal, enlarged at apex into a flat densely pubescent head (fig. 28e). Mesonotum metallic blue in direct light, rather densely brown pollinose. Scutellum blue-green in ground color. Legs chiefly yellow. Front and hind legs without unusual bristles or cilia, each hind femur with two anteroventral bristles near apex. Each middle femur rather strongly swollen on basal two-thirds attenuated at apex, with a row of black anteroventral bristles extending from basal third to apical third and with a row of yellow-white, curled, ventral hairs extending from basal to apical third. Each middle tibia slender, arcuate on anterior surface, densely haired on anterior and anteroventral surfaces at apex. Basitarsus very short with a long apical spine. Second tarsal segment slender, arcuate, one-half as long as tibia, and covered with long fine cilia. Abdomen short, about equal in length to thorax.

Length: body, 1.50-1.70 mm.; wings, 1.75-2.00 mm.

Campsicnemus penicillatus Parent (fig. 29a-c).

Campsicnemus penicillatus Parent, 1934, Mem. Soc. Natl. Sci. Nat. Math. Cherbourg 41:300, pl. 77, fig. 6; pl. 78, fig. 7.

Endemic. Hawaii (type labeled "Sandwich Is." Com. R. Soc.). Known only from Hawaii and Molokai.

Type in the British Museum (Natural History).

A very distinctive species fitting in the group with short middle basitarsus armed with a large black apical spine; front femur with a clump of strong ventral bristles near base, and middle femur without ventral bristles. It is related to *C. goniochaeta* n. sp. but the bristling of the legs is quite different. The middle tibia has three dense clusters of fine bristles on the flattened dorsal surface (fig. 29b); also, the large posterodorsal bristle is more distad, situated at apical third of segment rather than nearer the middle.

Thorax predominantly black, lower portion of pleura and sides of scutellum yellow; propleura and lower margins of humeri tinged with yellow in ground color. Antennae yellow, third segment tinged with brown around the apex. Third segment just slightly longer than wide and rounded at apex. Legs predominantly yellow, middle coxa brown. Front femur rather strongly swollen, with a dense clump of large, flattened, closely placed ventral bristles extending over basal third (fig. 29a). Middle tibia strongly flattened on dorsal surface with three dense clumps of fine bristles, one at base, one at basal two-fifths, and one near apex of segment. Midbasitarsus, excluding the spur, about four-fifths as long as the second tarsal segment (fig. 29c).

Length: body, 3.0 mm.; wings, 3.5 mm.

Campsicnemus perplexus Hardy and Kohn, new species (fig. 29d-e).

Fitting very close to *C. spinicoxa* n. sp., from Hawaii, by having the middle basitarsus short, armed with a large apical spur, and with a strong bristle at the apex of the front coxa. It differs strikingly from this species by having the front femur bare below, except for one or two bristles at apex; also the middle basitarsus is almost one-half as long as the second tarsal segment and the other leg characters differ as in figure 29e.

MALE. Small, chiefly yellow species. *Head*: Eyes contiguous or nearly so in the middle of the face for a distance of about three to four rows of eye facets. Face rather densely gray pubescent. Front and vertex gray, faintly metallic. Antennae yellow, third segment brown around the margin, pointed at apex and about one-half longer than wide. *Thorax*: Entirely yellow except for a brown spot on the metapleura and on extreme sides of metanotum; on the two male specimens at hand there is no indication of brown vitta on the mesonotum. Four pairs of dorsocentral bristles and one row of acrostichals present. *Legs*: Entirely yellow except for a brownish tinge on apical segments of tarsi. Front femur with one small anteroventral and two small posteroventrals at apex. Front coxa with

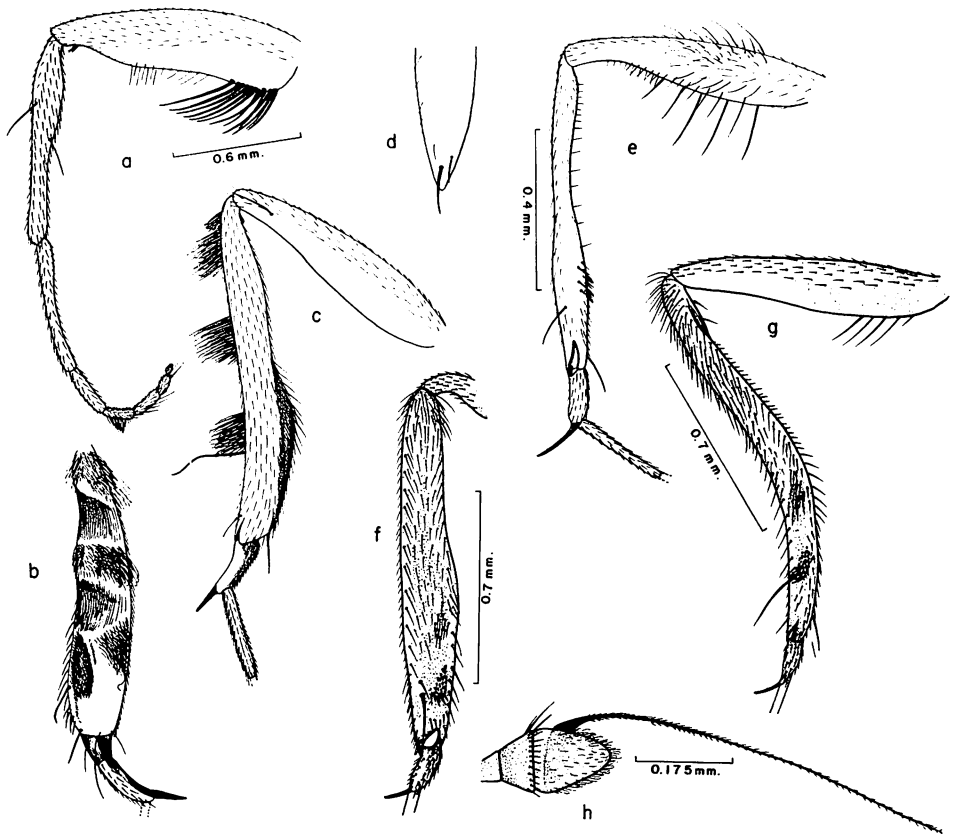


Figure 29—*Campsicnemus penicillatus* Parent: a, foreleg, posterior view; b, middle tibia, dorsal view; c, middle leg, posterior view. *C. perplexus* n. sp.: d, front coxa; e, middle femur, tibia, and basal two tarsal segments, anterior view. *C. petalcnemus* n. n.: f, middle tibia, and basitarsus, dorsal view; g, middle femur, tibia, and basitarsus, anterior view; h, antenna of male.

one large bristle and one small bristle at apex (fig. 29d), the larger about equal in size to the anterodorsal bristle situated near the apical fifth of the middle femur; it is sharp-pointed rather than being rather flat and blunt as in *spinicoxa*. Middle femur moderately swollen, the posteroventral surface with a row of bristles extending from about basal third to apical fourth, and those toward the apex smaller, more pale in color; anteroventral surface with numerous yellow-brown bristles or hairs extending over the apical half; these are stronger near the middle of the segment. Middle tibia somewhat enlarged, flattened dorsoventrally and curved, posteroventral surface with a row of moderately long, rather blunt bristles extending from apical two-fifths to the base of the segment; anteroventral surface with a dense clump of short, stout bristles at about apical fourth; one strong anterodorsal near apical fourth of segment and one strong ventral at apex. Middle basitarsus with a strong black spur at apex; not counting the spur the segment is about half as long as the second tarsal segment (fig. 29e). Hind femur with

three rather strong posteroventrals at middle of segment and a series of small, yellow-brown bristles extending to about the basal fourth of the segment. *Wings*: Hyaline. Fourth costal section one-half to two-thirds longer than fifth. Last section of M_{3+4} three times longer than m crossvein. *Abdomen*: Entirely yellow with a faint tinge of brown at apices of terga.

Length: body, 1.7 mm.; wings, 2.4 mm.

FEMALE. Similar to the male except that the third antennal segment is about as wide as long. The face, at its narrowest portion, is about equal in width to one row of eye facets and the mesonotum has a faint brown vitta extending down each dorsocentral row. The large black bristle of front coxa is as well developed as in the male, and the secondary bristle is well developed.

Holotype male: Puu Kukui, Maui, 4,500 ft., June, 1954 (D. E. Hardy). Allotype female: same data as type, June, 1953 (C. R. Joyce). Twenty-four paratypes, predominantly males: same data as type; Haleakala, Maui, July 14, 1919 (year questionable—the pin was through the label at this point), on *Broussaisia*, 5,000 ft. (collector unknown); Waikamoi, Maui, 4,000 ft., July, 1956 (D. E. Hardy and R. Namba); Kula Pipeline Trail, above Waikamoi, Maui, 4,200 ft., July, 1956 (D. E. Hardy and R. Namba); Haelaau, Maui, December 19, 1928, on *Broussaisia* (O. H. Swezey); Wailau Pass, Mapulehu, Molokai, December, 1927, on green leaf (F. X. Williams).

Type, allotype and some paratypes in the B. P. Bishop Museum. Paratypes are in the collections of the U. S. National Museum, British Museum (Natural History), and the University of Hawaii.

***Campsicnemus petalicticus*, new name (fig. 29f–h).**

Campsicnemus arcuata Adachi, 1953, Proc. Haw. Ent. Soc. 15:117, fig. 2a–d. Preoccupied by *C. arcuatus* Van Duzee, 1917, Ent. News 28:125.

Endemic. Molokai (type locality: Puu Kolekole, 4,000 ft.). Common on the ground litter in wet areas on top of the mountain on Molokai.

Fitting in the group of species which has a short middle basitarsus, bearing an apical spur. It is close to *C. pycnochaeta* n. sp., from Hawaii, but differs by having the entire dorsal surface of middle tibia covered with recumbent hairs; the middle basitarsus is not curved, and also by other details as shown in figure 29f–g. Predominantly dark-bodied, moderate-sized species. Antennae yellow, third segment just slightly wider than long, rounded at apex (fig. 29h). Thorax brown, lateral margins of mesonotum, humeri, and scutellum tinged with brown. Legs predominantly yellow. Each middle femur with three or four ventral bristles near base, otherwise devoid of bristles below. Each middle tibia strongly arcuate, flattened dorsoventrally, densely haired on the dorsal surface and with a patch of short stout bristles on the anterodorsal surface near apical third of segment. Middle basitarsus short and straight and bearing a black spine at apex, about two-thirds as long as the second tarsal segment. Each hind femur with a row

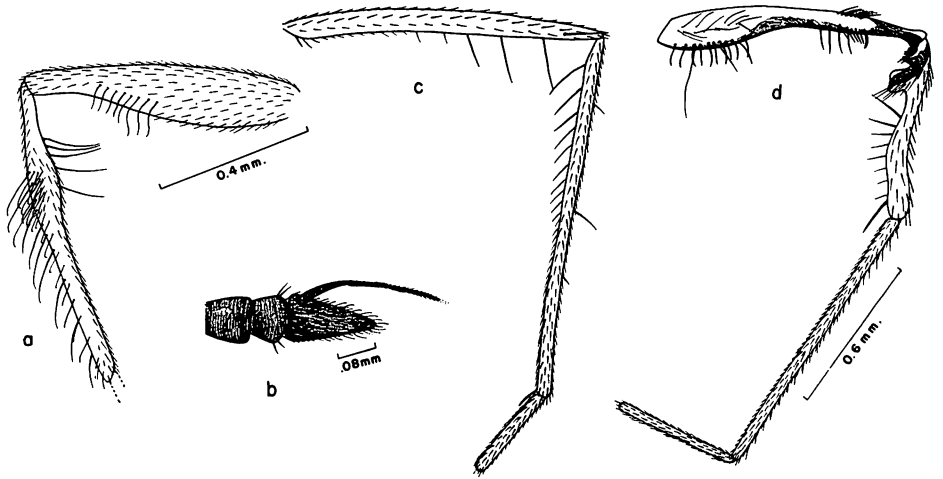


Figure 30—*Campsicnemus pherocteis* n. sp.: a, middle femur and tibia, anterior view. *C. philohydratus* n. sp.: b, antenna; c, hind femur, tibia, and basitarsus; d, middle femur, tibia, and basal two tarsal segments, anterior view.

of rather well-developed anteroventral bristles extending the entire length of the segment. For other details refer to figure 29 f–g and to the original description.

Length: body, 2.0 mm.; wings, 2.7 mm.

***Campsicnemus pherocteis* Hardy and Kohn, new species (fig. 30a).**

Fitting in the complex which lacks ciliation on middle tarsi, which has the middle basitarsus slender, which has a dorsal bristle on front tibia and the middle tibia with no blunt posteroventral bristles but with long ciliation. It runs near *C. acuticornis* Parent but differs by having the thorax dark brown to black and the antennae black; the anterior bristles of middle femur reclinate, the middle tibia with long ventral hairs on basal two-fifths, with a patch of dorsal bristles at basal two-thirds, and a row of anterodorsals extending from basal third to apex of segment (fig. 30a).

MALE. Small, dark-bodied species. **Head:** Eyes separated on the face; at the narrowest portion the face is almost as wide as two rows of eye facets; face entirely gray pubescent. Front and vertex blue-black in ground color, covered with gray-brown pollen. Antenna black, third segment broken off the specimen at hand. **Thorax:** Dark brown to black covered with brown pollen on the mesonotum. Four pairs of dorsocentral bristles present, the first pair small, poorly developed. Also one row of well-developed acrostichal setae present. Halteres yellow. **Legs:** Discolored with brown on basal portions and along the dorsal edges of femora, also over apical two-thirds of tibiae. Tarsi and middle and hind coxae brown. Front coxa, apex of femur, and base of tibia yellow. Front femur devoid of ventral bristles. Middle tibia with a strong anterodorsal bristle at middle. Front

basitarsus almost three-fifths as long as tibia. Middle femur with no ventral bristles but with a row of reclinate hairs extending from basal third to apical third along anterior surface. Middle tibia slightly curved. Posteroventral surface with about five long hair-like bristles at basal one-fourth; also with a dense clump of long hairs at basal third extending over dorsal surface onto the anterodorsal surface (fig. 30a); these are longer and stronger on the latter and extend down this surface to the apex of the segment but become more sparsely spaced on apical one-half. Hind femur lacking ventral bristles but with a row of inconspicuous suberect hairs extending along anteroventral surface. *Wings*: Lightly fumose. Fourth costal section slightly longer than fifth. Last section of M_{3+4} nearly three times longer than m crossvein. *Abdomen*: Dark brown, faintly gray dusted.

Length: body, 1.35 mm.; wings, 2.00 mm.

FEMALE. Unknown.

Holotype male: Mt. Waialeale Trail, Kauai, 4,500 ft., August, 1953 (D. E. Hardy).

Type in the B. P. Bishop Museum.

***Campsicnemus philohydratus* Hardy and Kohn, new species (fig. 30b-d).**

Fitting in the group of species which has a sub-basal projection on middle tibia, the apical half of segment swollen, and the basitarsus of middle legs distinctly longer than tibia. It fits near *C. contortus* Parent and *lepidochaites* n. sp. but is distinguished by having the middle basitarsus one-half longer than tibia and the projection at base of middle tibia broad and truncate; also, the other details of the middle legs are quite different as shown in figure 30d.

MALE. *Head*: Face yellow, densely silvery pubescent on the lower portion; at its narrowest point the face is about equal in width to eight rows of eye facets. Front brown, the upper portion and the vertex submetallic blue, distinctly metallic in direct light. Antennae black, third segment long, cone-shaped, two and one-half times longer than its greatest width (fig. 30b). *Thorax*: Dorsum shining black in ground color. Scutellum metallic blue in direct light and mesonotum polished black in the median portion, rather densely brown pollinose. Pleura brown to black, faintly tinged with yellow-brown in ground color and covered with gray pollen. Knobs of halteres brown. *Legs*: Entirely dark colored, brown to black except for brownish yellow front coxae and ventral portions of femora. Segments of front and hind legs comparatively long and slender. Front legs without conspicuous bristles. Each hind femur with four moderately long, black, anteroventral bristles extending from middle of segment to near apex. Each hind tibia with a row of moderate, black, posteroventral bristles extending from middle to near base of segment (fig. 30c). Each middle femur rather strongly swollen at base and attenuated at apical portion, with a row of about a dozen black anteroventral bristles extending over the swollen portion and two yellow-brown ventral bristles near basal third of segment; also with a row of four rather thick, black, posteroventral bristles at about apical third of segment; a row of seven

anteroventral bristles near apical fourth (four of these are very closely placed) and with a row of eight to ten closely placed anterodorsal bristles at apical fourth. Middle basitarsus one-half longer than tibia. Each middle tibia comparatively short, just slightly curved and with a rather large truncate projection near basal one-fifth, also with another slight projection just before the base. Each middle tibia with a row of six or eight rather short, scale-like, ventral bristles, extending from the sub-basal projection to base, also with a clump of three black, rather flat, anterior bristles near sub-basal projection; a row of about a dozen anterodorsal bristles extending over basal half and with a row of six or seven, rather long, anteroventral bristles extending from near middle to apex of segment and including the preapical bristles (fig. 30d); also with a row of posteroventral bristles extending over most of the segment; the three or four apical bristles are the strongest. *Wings*: Light brown fumose. Fourth costal section one-half to two-thirds longer than fifth. Last section of M_{3+4} about two times longer than m crossvein. *Abdomen*: Black, densely covered with brown pollen, faintly bluish in direct lights. The genitalia have not been dissected.

Length: body, 2.0–2.1 mm.; wings, 3.2 mm.

FEMALE. Antennae pointed, but just slightly longer than wide. Front and vertex distinctly metallic blue. Mesonotum rather brightly blue-black in direct light and abdomen with a greenish-blue sheen. Legs not ornamented.

Length: body, 2.2 mm.; wings, 3.3 mm.

Holotype male, allotype female, and 19 paratypes (16 males and 3 females): Puu Niania, Haleakala, Maui, June, 1954 (collector not given). Also 9 paratypes (5 males, 4 females): Waikamoi, Maui, 4,000 ft., July, 1956 (D. E. Hardy and R. Namba).

Type, allotype, and a series of paratypes in the B. P. Bishop Museum. Remainder of paratypes in the following collections: U. S. National Museum, British Museum (Natural History), Hawaiian Sugar Planters' Association, and the University of Hawaii.

***Campsicnemus planitibia* Parent (fig. 31a–c).**

Campsicnemus planitibia Parent, 1939, Proc. Haw. Ent. Soc. 10:232, fig. 16.

Endemic. Oahu (type locality: Mt. Kaala Trail, 800 ft.). Common in the Waianae Mountains and also occurring in the Koolau Range.

Type in the British Museum (Natural History). Cotypes from Palikea in the Museum National d'Histoire Naturelle, Paris.

Fitting in the group of species with the short midbasitarsus bearing an apical spine and with the middle tibia rather strongly flattened dorsoventrally. It is differentiated from related species by the short, slightly flattened, second segment of front tarsus which is about one-fifth the length of the basitarsus and about one-half the length of the third segment (fig. 31a), and also by the details of the middle legs as shown in figure 31c and as described below.

A moderately small species. Antennae yellow, third segment tinged with

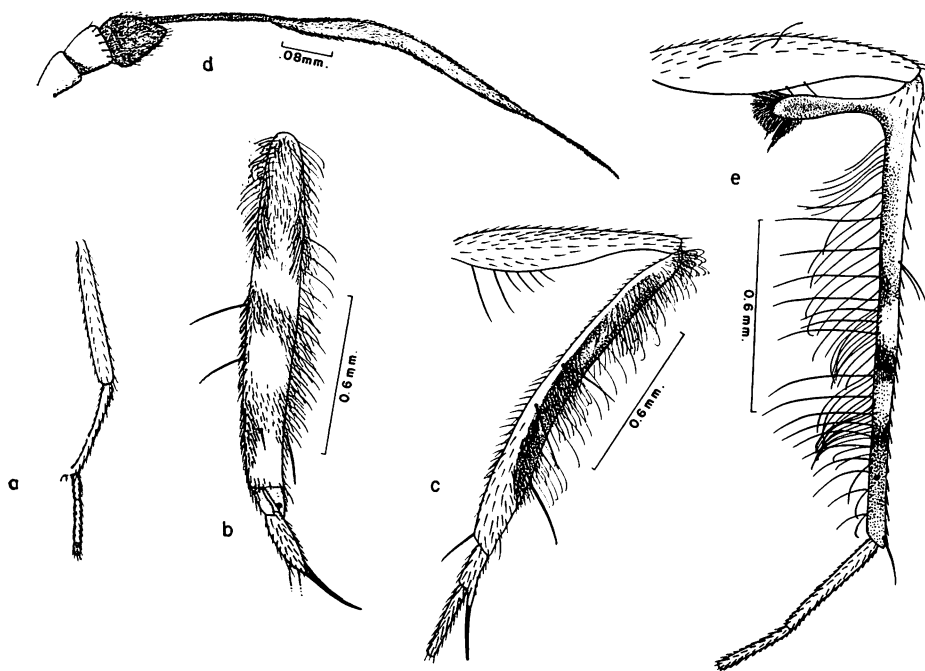


Figure 31—*Campsicnemus planitibia* Parent: a, front tibia and basal tarsal segments; b, middle tibia and basitarsus, dorsal view; c, middle femur, tibia, and basal two tarsal segments, anterior view. *C. platystylatus* n. sp.: d, antenna; e, middle femur, tibia, and basal two tarsal segments.

brown, about one-half longer than wide. Arista arising near the base. Mesonotum, metanotum, and upper half of pleura yellow-brown to black. Lower portion of pleura, sternum, and scutellum, except for a brown spot on the disc, entirely yellow. Mesonotum metallic blue-green in direct light. Legs all yellow; front and hind legs not ornate except for the shortened, rather flat, second tarsal segment. Each middle femur with two strong sub-basal bristles and a row of about four short bristles extending along the basal third of the ventral surface. Each middle tibia rather strongly flattened dorsoventrally and densely bristled and pilose on the dorsal surface, with the concentration of dense pile on the basal portion and along the postero- and anterodorsal surfaces (fig. 31b). Spur of mid-basitarsus elongate, slightly longer than the segment. Basitarsus, not counting the spur, just slightly more than one-half as long as the second tarsal segment (fig. 31c).

Length: body, 1.70–2.00 mm.; wings, 2.75 mm.

Campsicnemus platystylatus Hardy and Kohn, new species (fig. 31d–e).

This species is differentiated from all other known *Campsicnemus* by the flat

and thickened arista (fig. 31d) and by the peculiar projection developed at base of the middle tibia (fig. 31e).

MALE. *Head:* Antennae yellow, third segment tinged with brown and about as wide as long, rounded at apex. Arista flat, strap-like (fig. 31d). Eyes narrowly separated on the upper portion of the face, lower part of face rather densely yellow-gray pubescent. Front and vertex metallic blue-black in ground color, rather densely dusted with brown. *Thorax:* Mesonotum brown, yellow on the extreme lateral margins. Humeri, scutellum, and upper portion of pleura yellow, tinged with brown; lower portion of pleura and sternum all yellow. Only three pairs of dorsocentral bristles and no acrostichals present. Halteres yellow. *Legs:* Predominantly yellow. Middle coxa tinged with brown on outer surface. Hind femur tinged with brown on dorsal margin at apical third to two-fifths of segment. Middle tibia and all tarsi largely brown. Each front femur devoid of bristles or conspicuous setae below, rather strongly thickened on basal two-thirds, sharply attenuated apically. Each middle femur rather slender, devoid of bristles except for two anteroventrals at apical third. Each middle tibia slender, almost straight, with a strong, straight projection extending from base on anterior margin, like the handle of a cane; this projection is slightly enlarged and densely haired at apex and is nearly one-third as long as remainder of tibia (fig. 31e). Middle tibia densely covered with elongate, curled hairs on anteroventral and ventral surfaces. The middle basitarsus is slender and is one-third to one-half longer than the second tarsal segment. Each hind femur has one strong anteroventral bristle near apical fourth and a row of small anteroventrals extending to base of segment. *Wings:* Almost hyaline, just slightly dusky. Fourth costal section about one-third longer than fifth. Veins R_{4+5} and M_{1+2} parallel. The m crossvein slightly oblique. Last section of M_{3+4} two times longer than the m crossvein. *Abdomen:* Dark brown to black. About equal in length to the thorax. The genitalia have not been relaxed for study.

Length: body, 1.75 mm.; wings, 2.40 mm.

FEMALE. Unknown.

Holotype male: Alakai Swamp, Kauai, 4,000 ft., August, 1953 (D. E. Hardy).

One paratype male: Alakai Swamp, August 9, 1925 (O. H. Swezey).

Type in the B. P. Bishop Museum. Paratype in the Hawaiian Sugar Planters' Association collection.

***Campsicnemus plautinus* Adachi (fig. 32a-b).**

Campsicnemus plautina Adachi, 1953, Proc. Haw. Ent. Soc. 15:122, fig. 5a-d.

Endemic. Kauai (Nualolo Valley, 3,400 ft.). Known only from the Kokee region of Kauai.

Type in the U.S. National Museum.

Fitting in the group of species which has the middle basitarsus short and thickened and armed with an apical spur. It is distinguished from other species in this complex by having the second and third tarsal segments of front legs

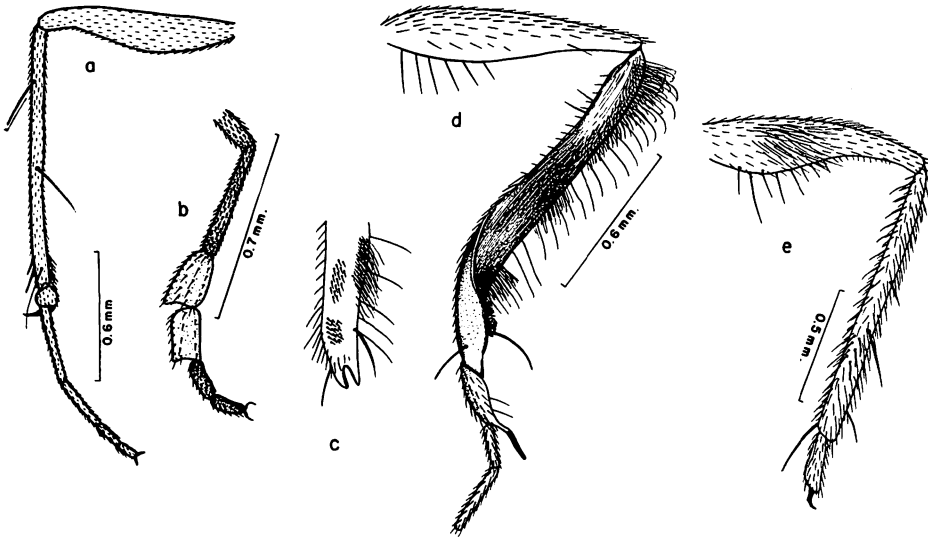


Figure 32—*Campsicnemus plautinus* Adachi: a, middle leg, posterodorsal view; b, front tarsus. *C. profusus* n. sp.: c, apex of middle tibia, dorsal view; d, middle femur, tibia, and basal tarsal segments, anterior view. *C. putillus* n. sp.: e, middle femur, tibia, and basitarsus, anterior view.

flattened and broad (fig. 32b) and by the lack of ventral bristles on the middle femur.

A moderately small species. Thorax reddish yellow, mesonotum with one faint, brown vitta down each dorsocentral row. Antennae yellow, third segment rounded at apex, slightly wider than long. Legs chiefly yellow, lacking unusual bristles or cilia. Front tarsi as in figure 32b. Middle basitarsus one-fifth the length of the following segment (fig. 32a).

Length: body, 2.00–2.30 mm.; wings, 2.75 mm.

The original description is adequate.

***Campsicnemus profusus* Hardy and Kohn, new species (fig. 32c–d).**

Fitting in the group of species which has a strong apical spine on middle basitarsus. It appears rather closely related to *C. petallicnemus* n. sp. but differs by having the middle basitarsus slightly longer than second tarsal segment and apical spur equal in length to second tarsal segment (fig. 32d) rather than basitarsus being much shorter than second and the spur one-half as long as second; also, the dorsal surface of middle tibia is bare or sparsely haired at middle (except for the two black patches and for fine hairs at base) whereas in *petallicnemus* the entire dorsal surface between the postero- and anterodorsal rows is densely haired.

MALE. Head: Eyes contiguous on the face for a distance about equal to five or six rows of eye facets. Lower portion of face rather densely gray pubescent.

Front and vertex submetallic blue-black in ground color, rather densely covered with brown pollen. Antennae yellow except for a brown tinge around margin of third segment, third segment rounded at apex, about as wide as long. *Thorax*: Mesonotum and upper portions of pleura brown, yellow on humeri and margins of scutellum; lower portions of pleura yellow. Halteres entirely yellow. Four pairs of dorsocentral bristles present, also two or three black acrostichal setae present on anterior third of mesonotum. *Legs*: Yellow except for yellow-brown tarsi and for brown discoloration on outside of middle coxa and apices of hind femora. Each middle basitarsus with a row of rather closely placed anterodorsal bristle-like hairs on the apical half of the segment, also with numerous black setae scattered over the dorsal surface. Middle femur rather slender, with a row of about seven ventral bristles extending from near middle to near base of segment, also with one rather strong preapical posteroventral bristle. Middle tibia rather strongly flattened dorsoventrally, and curved (fig. 32d), with numerous bristles and hairs extending the entire length of the segment on the anterodorsal and posterodorsal surfaces; rather sparsely haired on the dorsal surface except for dense fine hairs at base of segment and for two dense patches of black hairs toward the apex of the segment (fig. 32c). Middle basitarsus rather short and thick, just slightly longer than second tarsal segment, and with a large, blunt, straight spur at apex (fig. 32d). Hind femur slender with four rather well-developed posteroventral and about four or five anteroventral bristles just before apex of segment. *Wings*: Dusky fumose, almost hyaline. Fourth costal section one-half longer than fifth. Last section of M_{3+4} two and one-half times longer than m crossvein. *Abdomen*: Dark brown to black. The genitalia have not been relaxed for study.

Length: body, 2.2 mm.; wings, 2.7 mm.

FEMALE. Similar to the male, except lacking ornamentations on the legs, and the face about two facets wide at its narrowest point.

Length: body, 2.4 mm.; wings, 2.8 mm.

Holotype male, allotype female, and 154 paratypes (sexes about evenly distributed): Puu Kukui, Maui, 3,000–4,500 ft., June, 1953, and April, 1954 (D. E. Hardy and M. Tamashiro).

Type, allotype, and a series of paratypes in the B. P. Bishop Museum. Remainder of paratypes distributed among the following collections: U. S. National Museum, British Museum (Natural History), Hawaiian Sugar Planters' Association, State Department of Agriculture, and the University of Hawaii.

***Campsicnemus putillus* Parent (fig. 32e).**

Campsicnemus putillus Parent, 1938, Konowia 16:80, fig. 13.

Endemic. Molokai (type locality: "E. Molokai"). Known only from the type. Type in the Hawaiian Sugar Planters' Association collection.

Fitting in the group of species which has the middle basitarsus short and terminating in a spur. It appears to be closely related to *C. congregatus* Malloch

and differs by having a large anterodorsal bristle just above the patch of short anterior bristles and not below as in *congregatus* (cf. figs. 8a and 32e). A predominantly yellow species, mesonotum brown in the median portion, yellow around the margins. Four pairs of dorsocentral bristles and a few pale, inconspicuous acrostichal setae (in a single row on anterior fourth of mesonotum) are present. Antenna bright yellow except for the brownish yellow arista; third segment pointed, about one-half longer than wide. Front basitarsus rather long and slender, slightly curved on anterior surface, nearly three times longer than second tarsal segment and almost as long as tibia. Middle femur slender, anterior surface with a dense patch of curled yellow hairs at middle, these extend to apex of segment along anterodorsal surface; posteroventral surface with six rather strong bristles arranged from basal fourth to apical third of segment; anteroventral surface with two or three moderately strong bristles near middle and with several fine hairs extending to about apical third of segment. Middle tibia slender, with a patch of rather short, thick anterior bristles near apical fourth, a row of moderately long, slender, apically curved, pale bristles or hairs along anteroventral surface (these are slightly greater in length than the width of the segment), also with about two rows of erect setae down the ventral surface. Middle basitarsus slightly over half as long as second segment and with a curved spur at apex (fig. 32e).

Length: body, 1.75 mm.; wings, 2.25 mm.

***Campsicnemus pycnochaeta* Hardy and Kohn, new species (fig. 33a).**

Belonging in the group of species with the short middle basitarsus armed with an apical spur and with the middle tibia flattened dorsoventrally (fig. 33a). It is related to *C. petalictenus* (new name for *arcuata* Adachi, nec Van Duzee), but is distinguished by not having the dorsal surface of middle tibia covered with recumbent hairs; by having only one rather than two patches of dark setae beyond apical third of middle tibia, and by having the basitarsus curved and shorter than the second tarsal segment.

MALE. *Head:* Eyes closely approaching one another on the face for a distance equal to about six rows of eye facets. Lower portion of the face densely gray-white pubescent, upper portion brown to black. Front and vertex metallic green to coppery, covered with gray pollen. Antennae yellow, third segment just slightly longer than wide, subacutely pointed at apex. Arista sub-basal, entirely dark brown except at extreme base. *Thorax:* Entirely yellow except for a brown spot over the metapleura extending onto sides of the metanotum, a brown mark in middle of hind portion of mesonotum, on middle of scutellum, and a faint brown vitta down each dorsocentral row. Four pairs of dorsocentral bristles and only three or four acrostichal bristles present. *Legs:* Predominantly yellow, outside surface of middle coxa and most all of tarsi discolored with brown. Front femur devoid of ventral bristles except for three short posteroventrals near apex. Each

hind femur with a row of moderately developed anteroventrals extending the entire length of the segment. Middle femur devoid of conspicuous ventral bristles, but with a row of fine anteroventrals extending through the median portion. Each middle tibia rather strongly flattened dorsally, with a dense patch of short, stout bristles and setae at apical third of dorsal surface, with a row of three strong (curved at apices) plus two short anterodorsal bristles at apical third of segment; also one strong posterodorsal at the apical sixth of the segment. Middle basitarsus curved; not counting the spur it is almost as long as the second tarsal segment (fig. 33a). *Wings*: Slightly dusky fumose. Fourth costal section about one-third to one-half longer than fifth. Veins R_{4+5} and M_{1+2} parallel. Last section of vein M_{3+4} two and one-half times longer than m crossvein. *Abdomen*: Dark brown to black, covered with gray-brown pollen, shining in ground color.

Length: body, 2.4 mm.; wings, 3.0 mm.

FEMALE. Unknown.

Holotype male: Keanakolu, Hawaii, 5,200 ft., taken on ground litter in wet rain forest, October, 1952 (D. E. Hardy). One male paratype: Upper Olaa Forest, Hawaii, August, 1952 (W. C. Mitchell); one male paratype: Kipuka Puaula, Hawaii, September 28, 1919 (no collector given).

Type in the B. P. Bishop Museum. Paratypes in the U. S. National Museum and the University of Hawaii collection.

***Campsicnemus rectus* Malloch (fig. 33b-c).**

Campsicnemus rectus Malloch, 1932, *Stylops* 1 (6):124.

Campsicnemus flavicornis Van Duzee, 1933, *Proc. Haw. Ent. Soc.* 8:317, figs. 18-20. **New synonymy**, based upon comparison of types.

Endemic. Oahu (type locality: of *rectus*, Mt. Olympus; of *flavicornis*, Mt. Ka-lena, Waianae Mts., 3,500 ft.). Common in both the Waianae and Koolau Mountains of Oahu.

Type of *rectus* (in rather poor condition) in the B. P. Bishop Museum; of *flavicornis*, in the Hawaiian Sugar Planters' Association collection.

Fitting in the group of species which lacks a spur on middle basitarsus; which has fine erect ciliation over basal two tarsal segments on middle legs; the middle tibia straight, and the third segment of front tarsus longer than second. It fits near *C. longiciliatus* Parent and it is distinguished by having an anterodorsal bristle situated near the base of middle tibia (fig. 33c) and by having no long cilia on anterodorsal surface of tibia.

Largely brownish yellow species with the abdomen brown, tinged with rufous. Legs yellow. Middle femur moderately swollen, with ventral bristles extending almost the entire length of the segment. The middle tibia is straight, not at all swollen or distorted. In addition to the characteristic anterodorsal bristle mentioned above there are several rather strong bristles on anterior surface at about apical third of segment. Basal three segments of middle tarsi with erect cilia on

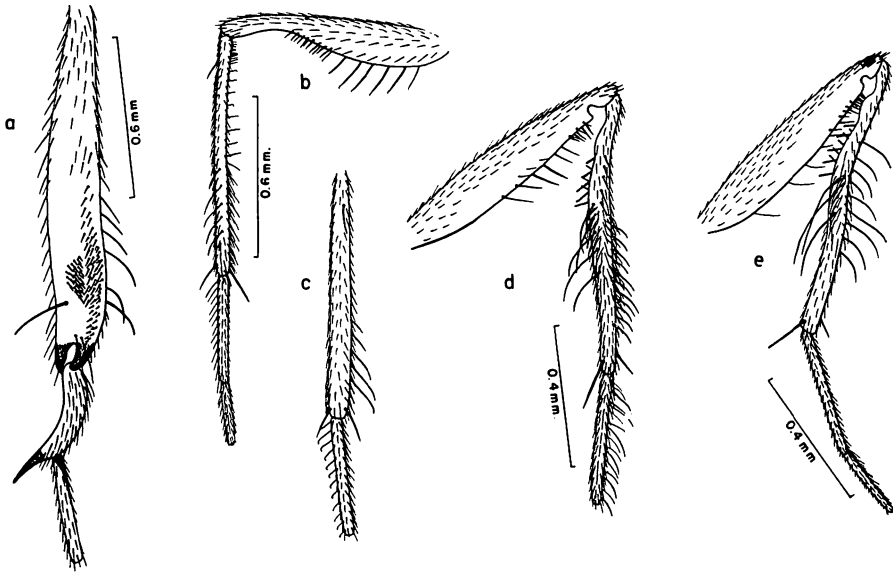


Figure 33—*Campsicnemus pycnochaeta* n. sp.: a, middle tibia and basal two tarsal segments, dorsal view. *C. rectus* Malloch: b, middle femur, tibia, and basal two tarsal segments, anterior view; c, middle tibia and basitarsus, dorsal view. *C. restrictus* n. sp.: d, middle femur, tibia, and basitarsus, anterior view. *C. rhyphopus* n. sp.: e, middle femur, tibia, and basal two tarsal segments, anterior view.

posterior surface, middle basitarsus slender, about one-half to two-thirds longer than second segment (fig. 33b). Thorax varying from completely brown on the mesonotum and upper portion of pleura to predominantly yellow, with faint brown vittae down dorsocentral rows. For more complete descriptive details refer to Van Duzee's original.

Length: body, 2.0 mm.; wings, 2.4 mm.

***Campsicnemus restrictus* Hardy and Kohn, new species (fig. 33d).**

Fitting in the group of species which has the middle basitarsus longer than second tarsal segment, lacks an apical spur, and has ciliation only on the middle basitarsus. It fits near *C. loxothrix* but the bristling of the middle legs is very different; it is best differentiated by having the middle basitarsus one-half as long as the tibia. The middle tibia is distinctly curved, with five or six long, blunt posteroventral bristles at basal third (fig. 33d).

MALE. Head: Eyes joined on the face for a distance equal to about five or six rows of eye facets. Lower portion of face brownish yellow pubescent. Front and vertex metallic blue-green in ground color, rather thickly brown pollinose. Basal two antennal segments yellow, third segment brown, long-pointed, nearly three times longer than wide. **Thorax:** Pleura entirely yellow except for a brown spot

on metapleura. Mesonotum brown, yellow on the margins. Humeri and scutellum yellow, tinged very lightly with brown. Halteres yellow. Four pairs of dorsocentral bristles and a distinct row of acrostichals present. *Legs*: Predominantly yellow. Front and hind femora lacking ventral bristles except for one or two at extreme apex. Middle femur moderately slender, attenuated at apex, with eight to ten posteroventral bristles arranged from near middle of segment to apical fifth; the last five bristles are closely placed; also with about six small bristles on the anteroventral surface near apical third of segment. Middle tibia slender, rather strongly bent at basal third, with a row of blunt posteroventral bristles on basal third and a row of six to eight rather long hair-like anterior bristles at middle of segment (fig. 33d). The long ciliation of middle tarsus is confined to the posterodorsal surface of the basitarsus, there are no erect cilia along the anterior surface. Basitarsus slender, about half as long as the tibia. *Wings*: Almost hyaline. Fourth and fifth costal sections about equal in length. Last section of M_{3+4} about three times longer than m crossvein. *Abdomen*: Dark brown to black. The genitalia have not been relaxed for study.

Length: body, 1.5 mm.; wings, 2.0 mm.

FEMALE. Unknown.

Holotype male: Lanaihale, Lanai, 3,200 ft., June, 1953 (D. E. Hardy).

Type in the B. P. Bishop Museum.

***Campsicnemus rhyphopus* Hardy and Kohn, new species (fig. 33e).**

Fitting in the group of species which lacks fine ciliation on middle tarsus, which has the middle basitarsus slender, wings hyaline or nearly so, and the middle tibia with a row of blunt posteroventral bristles near base. It is related to *C. flavipes* n. sp. and is differentiated by the more strongly bent middle tibia with the blunt bristles confined to the basal fourth and with strong anterior bristles at middle of segment, and, also, by lacking ventral bristles on the median portion of the middle femur and by the middle femur being more strongly constricted at apex (fig. 33e).

MALE. *Head*: Eyes closely joined for a distance of about four rows of eye facets. Lower portion of face yellow-gray pubescent. Front and vertex metallic blue-green in ground color but rather densely covered with yellow-brown pollen. First two segments of antenna yellow; third segment brownish yellow, long-pointed, two and one-half times longer than wide. Arista brownish yellow, two and one-half times longer than remainder of antenna. *Thorax*: Yellow, with a brown spot on metapleura, a brown discoloration on each side of metanotum, and a brown vitta along each dorsocentral row. Four pairs of strong dorsocentrals present, plus one pair of short setae just in front of the first pair; also one row of well-developed acrostichals present. *Legs*: Chiefly yellow. Front and hind femora devoid of ventral bristles. Middle femur slender, strongly constricted at apex and with ventral bristles confined to the apical third of the segment, with

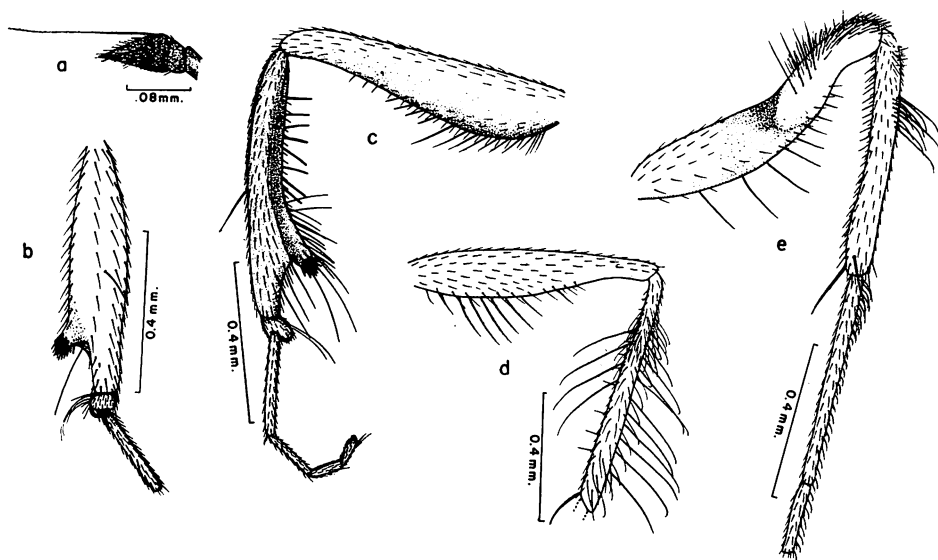


Figure 34—*Campsicnemus ridiculus* Parent: a, antenna; b, middle tibia and basal two tarsal segments, dorsal view; c, middle leg, posterior view. *C. sciurus* n. sp.: d, middle femur and tibia, anterior view. *C. scolimerus* n. sp.: e, middle femur, tibia, and basal two tarsal segments, anterior view.

one rather strong bristle at apical third plus a comb-like series of shorter closely placed bristles just before the constriction. Middle tibia as described above and as in figure 33e, with a small rounded development at base opposite the constriction of the femur. Middle basitarsus slender, two-thirds longer than second tarsal segment. *Wings*: Lightly fumose. Fourth costal section just slightly longer than fifth. Last section of M_{3+4} about three times longer than m crossvein. *Abdomen*: Largely brown, tinged with yellow, the sternum and basal three-fourths of first tergum yellow. The genitalia have not been relaxed for study.

Length: body, 1.6 mm.; wings, 2.1 mm.

FEMALE. Unknown.

Holotype male: Lulumahu Valley, Oahu, April 7, 1937, "banana grove" (F. X. Williams).

Type in the Hawaiian Sugar Planters' Association collection.

***Campsicnemus ridiculus* Parent (fig. 34a–c).**

Campsicnemus ridiculus Parent, 1938, Konowia 16:81, figs. 14–15.

Endemic. Molokai (type locality: near Moaula, 2,400 ft.—misspelled "Molaua" in the original description and "Moalua" on the type).

Type in the Hawaiian Sugar Planters' Association collection.

Fitting near *C. miritibialis* Van Duzee by having the short middle basitarsus

armed with a spine and by having a projection at apical third of middle tibia. The species is, however, much smaller, the antennae are more conical, two times longer than wide; the development of the legs is very different (fig. 34c).

A small, black-bodied species, rather faintly metallic green or blue-green on the dorsum of the thorax. Third antennal segment developed into a long, slender point (fig. 34a). Front coxae yellow, femora yellow on the ventral surfaces and at bases, legs otherwise brown to black. Basal half of front femur covered with dense, fine hairs on ventral surface (from the original description—the front legs of the type are broken off). Each hind femur is rather thickly covered with moderately strong bristles and fine hairs along the entire ventral surface. Each middle femur is moderately swollen and has a row of thick, short, black posteroventral bristles extending from near base to about apical third, also with a row of fine, short, bristle-like anteroventral hairs extending from near base to about apical third. The projection near apex of middle tibia is covered with numerous short black bristles. The tibia beyond this point has a number of long fine hairs. The basitarsus also has two or more long fine hairs (fig. 34b). Wings almost hyaline.

Length: body, 1.5 mm.; wings, 2.1 mm.

***Campsicnemus sciarus* Hardy and Kohn, new species (fig. 34d).**

Fitting in the group of species which has the middle tarsi without ciliation, the basitarsus slender, no dorsal bristle on front tibia or on basal half of middle tibia, and the middle tibia with fine ciliation extending along the entire antero-dorsal surface. It is distinguished from other species in this complex by having four to five long, fine, ventral setae on basal two-fifths of middle tibia.

MALE. Moderately small, dark-bodied species. *Head:* Eyes contiguous on the face for a distance equal to about four rows of eye facets. Upper and lower portions of face gray pubescent. Basal segments of antenna yellow, third segment broken off the specimen at hand. *Thorax:* Dark brown to black, tinged with yellow on humeri and around wing bases. Mesonotum rather densely gray pollinose. Four pairs of dorsocentral bristles and no acrostichal setae present. Halteres clear yellow. *Legs:* Almost all yellow. Front femur devoid of ventral bristles. Front basitarsus slender and curved, nearly three times longer than second tarsal segment and three-fourths as long as tibia. Middle femur slender, with rather strong ventral bristles extending from near basal fifth to apical third. Middle tibia straight, posteroventral surface with a row of short, erect setae extending the entire length. Ventral surface with four to five long hairs at basal third; antero-dorsal and anterior surfaces with numerous long hairs extending almost the entire length of the segment (fig. 34d). Dorsal bristle of middle tibia preapical. Middle basitarsus almost two times longer than second tarsal segment and slightly over half as long as tibia. Hind femur with rather well-developed anteroventral setae extending the full length; the longest hairs are approximately half the width

of the segment. Anterodorsal surface of hind tibia with one bristle at basal sixth, one at apical third, and one preapical. Dorsal surface with four bristles, one just before the middle, one tiny bristle at apical third, and one at apical fourth, also one preapical. *Wings*: Almost hyaline. Fourth costal section just slightly wider than fifth. Last section of M_{3+4} two and one-half times longer than m crossvein. *Abdomen*: Entirely black, rather densely gray pollinose. The genitalia have not been relaxed for study.

Length: body, 2.0 mm.; wings, 2.4 mm.

FEMALE. Unknown.

Holotype male: Lanai Mts., Lanai, October 29, 1947 (N. L. H. Krauss).

Type in the B. P. Bishop Museum.

***Campsicnemus scolimerus* Hardy and Kohn, new species (fig. 34e).**

Fitting in the group of species which has the middle basitarsus simple and longer than second tarsal segment, which has short erect ciliation over all of the middle tarsal segments, and in which the middle tibia is not sinuously curved. It is related to *C. diffusus* n. sp. but is distinguished by having a cluster of long dorsal bristles and hairs near basal third of middle tibia and lacking long hairs at apex of segment; also, the ciliation on middle tarsus is short, not longer than width of segment.

MALE. *Head*: Eyes almost contiguous on face, coming close together for a distance of about three eye facets. Lower face yellow-gray pubescent. Antennae yellow-brown, third segment obtuse, about as wide as long. *Thorax*: Entirely brown to black except for a tinge of yellow on the humeri and at wing bases, mesonotum brownish gray pollinose. Four pairs of well-developed dorsocentrals present and no acrostichals. *Legs*: Largely yellow. Front and hind legs without unusual bristles. Middle femur distinctly bowed on anterior margin, with a rather strong dense clump of long yellow-brown bristle-like anterior hairs at about apical third of segment, and with about a dozen posteroventral bristles extending almost the entire length of the segment (fig. 34e). Middle tibia straight or nearly so, with a clump of long black bristles or bristle-like hairs on anterodorsal surface at basal third and another clump of short bristle-like hairs on anterior surface at about basal one-sixth. Posteroventral surface with a row of short erect bristles extending the entire length of the segment. Middle basitarsus long and slender, three times longer than second segment and about four-fifths as long as tibia. *Wings*: Just slightly fumose. Fourth costal section about one-third longer than fifth. Last section of M_{3+4} two and one-half times longer than m crossvein. *Abdomen*: Black, about as long as thorax. The genitalia have not been relaxed for study.

Length: body, 1.85 mm.; wings, 2.40 mm.

FEMALES. The females have not been associated with the males.

Holotype male: Upper Olaa Forest, Hawaii, August, 1952 (D. E. Hardy).

Forty-one paratypes, all males, from the following localities on Hawaii: same as

type, some taken July, 1956 (D. E. Hardy and W. C. Mitchell) ; Kaiholena Ridge, August, 1952, 2,300 ft. (D. E. Hardy and W. C. Mitchell) ; Kahuku Ranch, 3,000 ft., July, 1953 (D. E. Hardy) ; Pauahi, 4,300 ft., August, 1952, and August, 1956 (D. E. Hardy) ; near Pawaina, Kona, 3,000 ft., July, 1953 (D. E. Hardy) ; Keanakolu, 5,200 ft., October, 1952 (D. E. Hardy) ; Kilauea, Hawaii National Park, February 1, 1945, December, 1950, and July, 1953; the earlier specimens collected on ginger leaf and on wet bank (F. X. Williams, N. L. H. Krauss, and D. E. Hardy) .

Type and some of the paratypes in the B. P. Bishop Museum. The remainder of paratypes distributed among the following collections: U. S. National Museum, British Museum (Natural History) , Hawaiian Sugar Planters' Association, State Department of Agriculture, and the University of Hawaii.

Campsicnemus setiger Hardy and Kohn, new species (fig. 35a, c, e).

Fitting in the group of species which lacks ciliation on middle tarsus and with the middle basitarsus slender; also the middle tibia has a sub-basal clump of long cilia. It is related to *C. modicus* n. sp. but the hind femur has a row of well-developed anteroventral bristles (fig. 35c) ; the dorsal surface of the front femur is yellow-brown; the middle femur has about eight strong posteroventral bristles extending to apical third (fig. 35a) , and a continuous row of short anteroventral setae extending almost to base of segment.

MALE. A rather small, dark-bodied species. *Head:* Eyes contiguous on the face for a distance equal to two or three rows of eye facets. Antennae yellow, discolored with brown on upper margin of third segment, third segment subacute and about one-half longer than wide. *Thorax:* Dark brown to black, gray-brown pollinose above. Four pairs of well-developed dorsocentrals and no acrostichals present. Halteres yellow. *Legs:* Predominantly yellow, middle coxa brown; dorsal surface of front femur faintly discolored with brown. Middle femur rather slender, bristles as noted in introduction above. Middle tibia almost straight, the dense clump of setae extending over basal third of segment with the long hairs concentrated along the postero- and anterodorsal surfaces and with short hairs between. Middle basitarsus slender, almost two times longer than second segment and about one-half as long as the tibia. Hind femur with well-developed anteroventral bristles extending from basal third to near apex of segment. Hind tibia as in figure 35e. *Wings:* Slightly fumose, almost hyaline. Fourth costal section a little longer than fifth. Last section of M_{3+4} about three times longer than m crossvein. *Abdomen:* Entirely black, about as long as thorax. The genitalia have not been relaxed for study.

Length: body, 1.5 mm.; wings, 2.1 mm.

FEMALES. The females have not been associated with the males. They probably cannot be differentiated from the related species.

Holotype male: Keanakolu, Hawaii, 5,200 ft., October, 1952 (D. E. Hardy) . Twenty-four paratypes, all males, from the following localities on Hawaii; same as

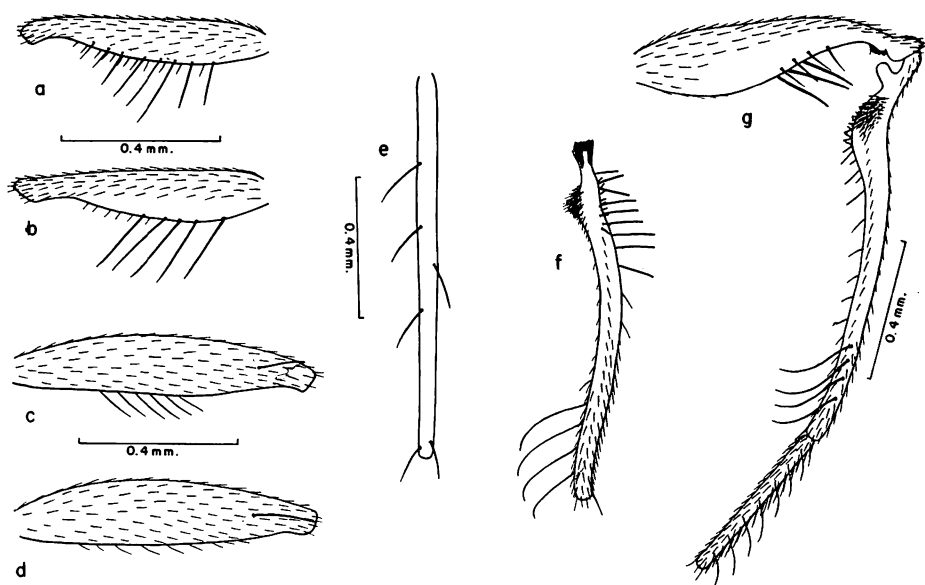


Figure 35—*Campsicnemus setiger* n. sp.: a, middle femur, posterior view; c, middle femur, anterior view; e, hind tibia, dorsal view. *C. modicus* n. sp.: b, middle femur, posterior view; d, hind femur, anterior view. *C. silvaticus* n. sp.: f, middle tibia, ventral view; g, middle femur, tibia, and basitarsus, anterior view.

type; Upper Olaa Forest, August, 1952, July, 1953, and July, 1956 (D. E. Hardy and W. C. Mitchell); Kahuku Ranch, 3,000 ft., July, 1953 (D. E. Hardy); and Kaiholena Ridge, August, 1952, 2,300 ft., (D. E. Hardy and W. C. Mitchell).

Type and some of the paratypes in the B. P. Bishop Museum. Remainder of paratypes distributed among the following collections: U. S. National Museum, British Museum (Natural History), Hawaiian Sugar Planters' Association, State Department of Agriculture, and the University of Hawaii.

***Campsicnemus silvaticus* Hardy and Kohn, new species (fig. 35f-g).**

Fitting in the groups of species which has the middle tibia sinuate and with a projection near base of segment. Differing from other species in this complex by having long cilia along the anterodorsal surface of middle basitarsus, by having ventral bristles only on apical third of middle femur, and the hind femur with three black posteroventral bristles near base.

MALE. Rather small, almost completely yellow species. *Head:* First two segments of antennae yellow, third broken from type (it is probably pointed and about one-half longer than wide, as in related species). The eyes are almost contiguous on the middle of the face for a distance equal to about four rows of eye facets. Lower portion of the face is gray pubescent. The front and vertex are

metallic green, rather lightly brown pollinose. *Thorax*: Entirely yellow except for a dark brown to black spot on metapleura extending onto side of metanotum and except for a brown vitta extending down each dorsocentral row. Four pairs of dorsocentrals and one row of acrostichals present. Halteres bright yellow. *Legs*: Entirely yellow, except for a brown discoloration on outside surface of middle coxa. Front femur slender, devoid of ventral bristles. Each middle femur rather strongly swollen on basal three-fifths, attenuated apically; with three rather strong posteroventral and four anteroventral bristles situated near the apical third of the segment and with a row of about six or seven short posteroventral bristles just before the apex. Middle tibia slender, distinctly curved, posteroventral surface with a row of eight rather strong, blunt bristles at basal one-third of segment (fig. 35f). Anteroventral surface with a dense clump of fine hair-like bristles near basal fourth and with a row of six strong bristles extending from apical third to apex of segment. Middle basitarsus slender, equal in length to the next two tarsal segments and about one-half as long as tibia, with long anterodorsal hairs extending the entire length (fig. 35g). Hind femur slender, with three black ventral bristles near base. *Wings*: Dusky fumose, fourth costal section one-third longer than fifth. Last section of M_{3+4} about two times longer than m crossvein. *Abdomen*: Yellow, with apical margins and median portions of terga brown.

Length: body, 1.7 mm.; wings, 2.2 mm.

FEMALE. The female has not definitely been associated with the male. Specimens on hand from the same general area fit the description of the male except for the lack of ornamentations on the legs.

Holotype male: Olaa Flume Rd., Hawaii, July, 1953 (D. E. Hardy). Three females on hand from Upper Olaa Forest, July, 1953 (D. E. Hardy), and from near Pawaina, Kona, Hawaii, 3,000 ft., July, 1953 (D. E. Hardy).

Type in the B. P. Bishop Museum. The female specimens are in the B. P. Bishop Museum and the University of Hawaii collections.

***Campsicnemus simplicipes* Parent (fig. 36a).**

Campsicnemus simplicipes Parent, 1938, Konowia 16:82, figs. 16–17.

Endemic. Molokai (type locality: Moaula Str. 2,100 ft., on water—misspelled “Moalua” on type).

Type in the Hawaiian Sugar Planters' Association collection.

Fitting in the group of species which lacks cilia on middle tarsi and with the middle basitarsus simple and slender; also the middle tibia lacks blunt posteroventrals bristles. It is related to *C. miser* Parent but is distinguished by having the middle femur with short fine hairs and no distinct bristles on the venter. Also, the middle tibia has only one dorsal bristle below the basal two-fifths (fig. 36a).

A moderately small, dark-bodied species. Antennae brown, third segment tinged with yellow, triangular in shape, about one-half longer than wide. Thorax

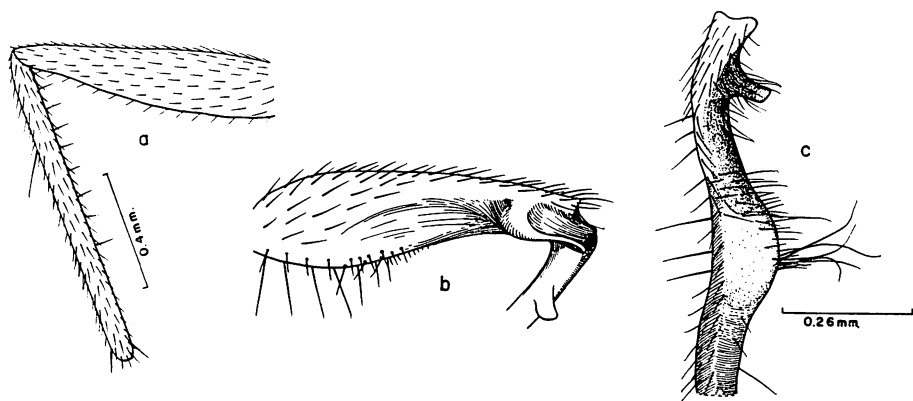


Figure 36—*Campsicnemus simplicipes* Parent: a, middle femur and tibia, anterior view. *C. sinuatus* Van Duzee: b, middle femur, anterior view; c, middle tibia, dorsal view.

black, dusted with gray on the mesonotum. Five pairs of well-developed dorso-centrals and one row of strong acrostichal setae are present. Middle and hind coxae black. Femora and tibiae yellow. Front femur lacking distinct ventral bristles but with erect setae on ventral surface. Middle femur moderately slender, without strong bristles on venter but with a row of erect posteroventral hairs extending over most of the segment. Middle tibia straight, slender, with a strong anterodorsal bristle near basal third and with a row of erect yellow-brown setae—one on anterior surface, one on anteroventral surface, and one on posteroventral surface extending the entire length of the segment. Middle basitarsus about one-half longer than second segment and approximately two-fifths as long as the tibia. Hind femur with a row of erect ventral setae but lacking distinct ventral bristles except for a few at apex. Wings light brown fumose. Fourth costal section two times longer than fifth.

Length: body, 2.0 mm.; wings, 3.0 mm.

***Campsicnemus sinuatus* Van Duzee (fig. 36b-c).**

Campsicnemus sinuatus Van Duzee, 1933, Proc. Haw. Ent. Soc. 8:324, figs. 45-48.

Endemic. Hawaii (type locality: Nauhi Gulch, 5,000 ft., on forest pools).

Type and allotype in Hawaiian Sugar Planters' Association collection, both in rather poor condition. The following notes are based upon the type.

Fitting in the group of species which has the middle tibia with a sub-basal projection and with the apical half swollen; also the middle basitarsus short, only about one-half as long as the tibia. It seems closest to *C. crinitibia* Van Duzee but has no spine-like process at apex of middle femur and the other leg characters differ as in figure 36b and 36c.

Mesonotum predominantly black, sides and scutellum reddish yellow. Pleura yellow, tinged with brown on upper meso- and metapleura. Front coxae and all femora yellow. Front femur lacking conspicuous bristles but with rather numerous short setae on ventral surface especially on basal half. Each hind femur with a row of rather strong anteroventral bristles extending the entire length of the segment. Each middle femur thickened basally, strongly arched ventrally beyond the middle, and enlarged and flattened on anterior face apically; the basal half of the segment is rather thickly covered with black bristles on the ventral portion. Each middle tibia strongly sinuate, the basal projection rather slender, rounded at apex, almost truncate, its length about equal to three-fourths the width of the segment. Other details of the tibia as in figure 36c.

Length: body, 1.8–2.0 mm.; wings, 2.2–2.4 mm.

***Campsicnemus spinicoxa* Hardy and Kohn, new species (fig. 37a–c).**

Fitting in the group of species which has a short middle basitarsus bearing a well-developed apical spine. Differing from all other known Hawaiian species in this complex by having a large spur developed at apex of each front coxa (fig. 37c) and by having ventral bristles on basal half of front femur. It is related to *C. perplexus* n. sp., from Maui, but this latter species lacks ventral bristles on the front femur and the middle basitarsus is longer.

MALE. *Head:* Antennae yellow, third segment pointed at apex, about two-thirds longer than greatest width. Eyes separated on the face; at its narrowest point the face is about as wide as one row of eye facets. Face silvery gray pubescent. Front and vertex metallic green in ground color, dusted with brownish gray pollen. *Thorax:* Dorsum black, metallic blue-green in ground color; mesonotum predominantly gray pollinose, more densely so on the sides, so the median portion is more brightly metallic in direct light. Well-developed acrostichal setae and four pairs of dorsocentral bristles are present. Pleura yellow-brown, except for the dark brown to black metapleura. Halteres entirely yellow. *Legs:* Almost entirely yellow, apical segments of tarsi and outside surface of middle coxa tinged with brown. Spine at apex of front coxa strong and blunt, almost equal in length to second tarsal segment. Front femur moderately thickened, with two rows of posteroventral and two rows of anteroventral bristles, these are strongest on the basal half of the segment; the upper row of posteroventrals extends almost to the apex of the segment but the size of the bristles diminishes sharply beyond the middle so those at the distal portion are reduced to tiny setae. Middle femur slightly swollen, with a row of ventral bristles extending from about basal third to apical one-fourth; the three basal bristles are the strongest (fig. 37a). Middle tibia rather thickened but not curved, somewhat flattened on ventral surface, densely covered with thin pale pile over the venter; with a large posteroventral spine at apex; with two or three short, thick spines on anterior surface at about apical fourth and one rather large, dorsal spine at a level with the short blunt spines;

also with a row of moderately developed posterodorsal bristles on basal half of segment. Middle basitarsus short, with a curved spine at apex; not counting the apical spine it is about one-fifth as long as the second tarsal segment (fig. 37b). Hind femur with a row of moderately developed posteroventral bristles on apical half. *Wings*: Hyaline. Fourth costal section just slightly longer than fifth. Last section of vein M_{3+4} almost three times longer than m crossvein. *Abdomen*: Entirely black, covered with brown to gray-brown pollen.

Length: body, 1.7 mm.; wings, 2.4 mm.

FEMALE. Similar to the male except lacking ornamented legs. The third antennal segment is rounded and slightly wider than long, the face is about two rows of eye facets wide at its narrowest point, and the coxal bristle is not as well developed as in the male.

Holotype male and allotype female: Pauahi, Hawaii, 4,300 ft., August, 1952 (D. E. Hardy). Fifty-four paratypes, sexes about evenly distributed: a large series, same data as type; north slope Hualalai, Hawaii, 4,000–6,000 ft., July, 1953 (D. E. Hardy); Upper Olaa Forest, August, 1952, July, 1953, and July, 1956 (D. E. Hardy and W. C. Mitchell); Waiakea Forest Reserve, Hawaii, December, 1950 (N. L. H. Krauss). This species lives on the ground litter in the rain forest on the island of Hawaii.

Type, allotype, and a series of paratypes in the B. P. Bishop Museum. Remainder of paratypes deposited in the following collections: U. S. National Museum, British Museum (Natural History), Hawaiian Sugar Planters' Association, State Department of Agriculture, and the University of Hawaii.

***Campsicnemus tarsiciliatus* Parent (fig. 37d).**

Campsicnemus tarsiciliatus Parent, 1939, Proc. Haw. Ent. Soc. 10:233, fig. 17.

Endemic. Oahu (type locality: Palikea), and Kokee, Kauai.

Type in the Hawaiian Sugar Planters' Association collection.

Fitting in the group which has ciliated middle tarsi and the basitarsus slender, also with the middle tibia slender, not flattened or curved. It appears related to *C. brevitibia* n. sp., from Hawaii, but differs by having no long anterior cilia on middle femur; by the slender middle tibia, nearly two times longer than basitarsus (9.5:5.5) and by having only the anterodorsal cilia developed on middle tibia (fig. 37d).

Antennae yellow-brown, third segment obtuse, as wide as long. Thorax brown, except for lower portion of pleura which is yellow. Humeri and upper portions of pleura brown, tinged with yellow. Middle femur moderately swollen, posteroventral surface (of type) with seven moderately developed bristles extending from apical third to basal one-fourth and with only a few small setae on anteroventral surface; specimens from Kauai have 10 to 12 posteroventral bristles. Middle tibia with one row of erect, curved cilia down anterodorsal surface, these are slightly longer than the width of the tibia and also with a row of erect postero-

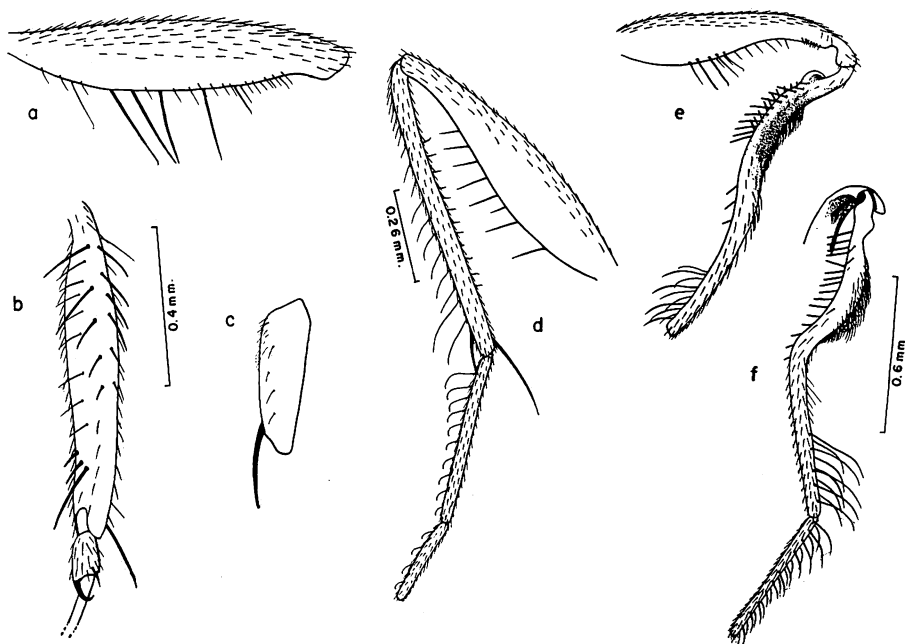


Figure 37—*Campsicnemus spinicoxa* n. sp.: a, middle femur, anterior view; b, middle tibia and basitarsus, dorsal view; c, front coxa. *C. tarsiciliatus* Parent: d, middle femur, tibia, and basal two tarsal segments, posterior view. *C. terracolus* n. sp.: e, middle femur and tibia, anterior view; f, middle tibia and basitarsus, dorsal view.

ventral, brownish yellow setae about equal in length to the tibia. Basal three segments of middle tarsus ciliated on anterior margin; on type with 10 cilia on first segment and 4 on second and on Kauai specimens with 16 on first and 6 on second.

Length: body, 1.50–1.70 mm.; wings, 2.25 mm.

***Campsicnemus terracolus* Hardy and Kohn, new species (fig. 37e–f).**

Fitting in the group of species which has the middle tibia sinuate and possesses a knob-like process near the base. It fits nearest to *C. silvaticus* n. sp., but differs by having long, fine ventral hairs along the entire length of the front tibia; by having one or two stout, black ventral bristles near middle of hind femur; by the middle tibia being more sinuate (fig. 37f); and the middle basitarsus lacking the long, fine hairs.

MALE. Head: Basal two antennal segments yellow, third tinged with brown, pointed at apex and about one-half longer than wide. Eyes contiguous or nearly so on the middle part of the face for a distance about equal in length to about four or five rows of eye facets. Lower portion of face yellow-gray pubescent. Mouthparts largely yellow-brown. Front and vertex metallic green to black in

ground color, rather densely gray-brown pollinose. *Thorax*: Yellow except for a dark brown to black spot on each metapleuron, extending onto sides of metanotum, and for a brown vitta extending down each dorsocentral line. Four pairs of dorsocentrals and one row of acrostichals present. *Legs*: Yellow. Middle coxa brown on outside surface. Front tibia with two rows of rather long, pale hairs extending the entire length down the ventral surface. Middle femur swollen on basal three-fifths, attenuated apically. The anterior surface is rather strongly curved and the apex is produced into a rounded knob on the anteroventral surface; the posteroventral surface has a row of five or six moderately long, strong bristles at the middle of the segment and a row of short, thick bristles situated near the apical one-fourth; the anteroventral surface has a row of short, black bristles extending from near apical fifth to just below middle of segment (fig. 37e). The middle tibia is slender, but strongly sinuate; the posteroventral surface has a row of rather large, blunt bristles extending from about basal fourth to just beyond middle; the anteroventral surface has a dense group of short hairs arranged over the slightly swollen portion and has 10 or 12 long, curved bristles at apical fourth of the segment (fig. 37f). Anteroventral surface of middle basitarsus with moderate sized, erect hairs extending the entire length. Middle basitarsus slender, equal in length to next two tarsal segments and almost one-half as long as tibia. Hind femur slender, with one or two stout, black ventral bristles near middle of segment. *Wings*: Almost hyaline. Fourth costal section one-half longer than fifth. Last section of M_{3+4} three times longer than m crossvein. *Abdomen*: Largely yellow, apices of terga brown.

Length: body, 2.0 mm.; wings, 2.7 mm.

FEMALE. Unknown.

Holotype male: Keanakolu, Hawaii, 5,200 ft., July, 1952 (D. E. Hardy). Three paratype males: two same locality as type, October, 1952 (D. E. Hardy), and one Kaiholena, Hawaii, August, 1952 (W. C. Mitchell). Collected on the ground litter in the wet forest.

Type in the B. P. Bishop Museum. Paratypes in the following collections: U. S. National Museum, Hawaiian Sugar Planters' Association, and the University of Hawaii.

***Campsicnemus tibialis* Van Duzee (fig. 38a-b).**

Campsicnemus tibialis Van Duzee, 1933, Proc. Haw. Ent. Soc. 8:327, figs. 55-59.

Campsicnemus spinitibia Van Duzee, 1933, Proc. Haw. Ent. Soc. 8:325, figs. 49-51. **New synonymy.** The type (Hawaiian Sugar Planters' Association collection) is a female specimen of *tibialis*. The paratype male is a typical *tibialis*. *C. spinitibia* is not being given page priority since an error was made in determining the sex of the type.

Endemic. Hawaii (type locality: Nauhi Gulch, 5,000-6,000 ft., on forest

pools). Also known from Keanakolu, Hawaii, 5,200 ft., October, 1952 (D. E. Hardy). A water skater.

Type in the Hawaiian Sugar Planters' Association collection.

A very characteristic species fitting in the group with a simple middle basitarsus, slightly longer than second tarsal segment. Differing from other known species in this complex by the predominantly brownish black body and legs and by the broad face. In the latter regard it is more nearly like *C. bicoloripes* Parent, but the two are not related and they differ in many respects as pointed out in the key to species.

Entirely dark brown to dull black except for yellow front coxa and basal half to three-fourths of all femora. Legs very densely covered with suberect setae including dorsal surface of front coxa. Front and hind femora with moderately developed antero- and posteroventral bristles extending their entire length. Front tibia with a row of rather long, pale, hair-like posteroventral bristles extending their entire length (fig. 38a). Middle femur with rather stout posteroventral bristles and smaller anteroventral bristles extending their entire length. Middle tibia with a row of about 12 long, blunt, anteroventral bristles extending from near base to about apical third. All tarsi densely gray pilose beneath. Other details of legs as in figure 38b and as described by Van Duzee. Wings dusky (Van Duzee said "uniformly blackish"). Van Duzee also described the face as "narrow above, a little wider below"; the face at its narrowest point is about as wide as three rows of eye facets.

Length: body, 2.2 mm.; wings, 3.3 mm.

Campsicnemus truncatus Hardy and Kohn, new species (fig. 38c-d).

Fitting near *C. tibialis* Van Duzee in the group which has the middle basitarsus slender, lacks long ciliation, and which has the eyes rather widely separated on the face; also the middle tibia has elongate truncate posteroventral bristles. It differs from *tibialis* by lacking pale villi on the front tarsi, by having only three anterodorsal bristles on both the middle and hind tibiae. The middle basitarsus is one-third longer than second segment rather than about one-fifth longer; the hind femur has weak posteroventral setae rather than distinct rather well-developed hair-like bristles, and the pulvilli are shorter than claws rather than equal in length to the claws.

MALE. Predominantly dark-colored species. *Head:* Eyes apparently well separated on the face (in the specimens at hand the face is sunken in so that the margins of the eyes are pulled closer together than is normal). Face silvery white pubescent. Front submetallic black in ground color, covered with gray pollen. Antennae black, third segment triangular just slightly longer than wide. *Thorax:* Gray pollinose on the sides, dull brown to black on the dorsum. Middle portion of scutellum and mesonotum faintly metallic blue in direct light. Five pairs of dorsocentral bristles and one row of rather irregularly placed acrostichals present. Halteres with yellow stems and brown knobs. *Legs:* Front coxae yellow,

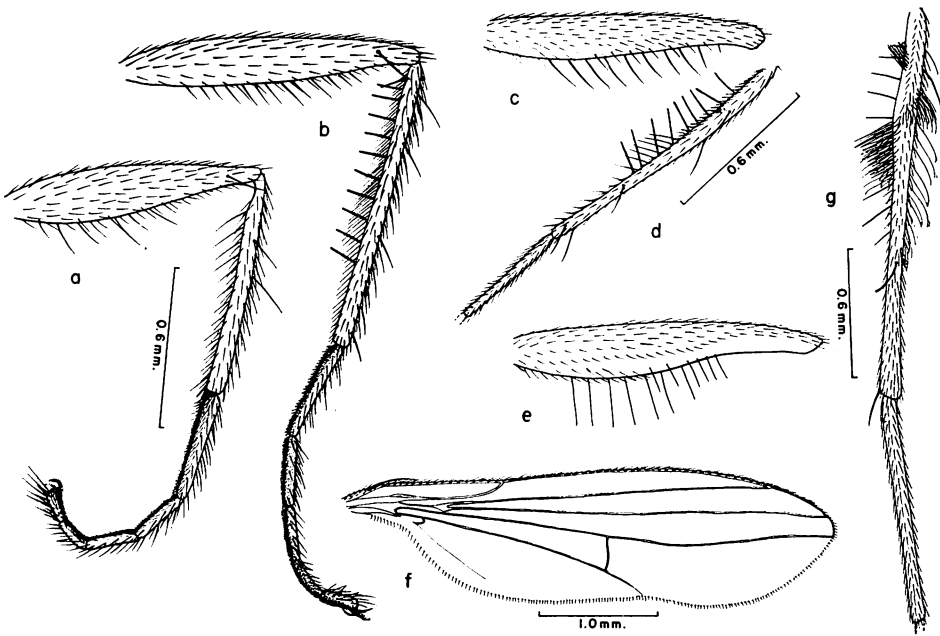


Figure 38—*Campsicnemus tibialis* Van Duzee: a, front leg, anterior view; b, middle leg, anterior view. *C. truncatus* n. sp.: c, middle femur, anterior view; d, middle tibia and basitarsus, anterior view. *C. undulatus* n. sp.: e, middle femur, anterior view; f, wing; g, middle tibia and basitarsus anterior view.

other coxae brown. All femora predominantly yellow with brown to black apices. Remainder of legs brown. Front femur with a row of erect posteroventral setae. The longest of these is almost half the width of the segment. Middle tibia with one dorsal bristle at basal third and another just slightly beyond middle of segment. Front basitarsus about three-fifths as long as tibia. Middle basitarsus one-third longer than second segment. Middle femur with well-developed, black, posteroventral bristles arranged from basal third to near apex of segment (fig. 38c). The truncate posteroventral bristles on middle tibia are about two times longer than width of segment (fig. 38d). The ventral surface of middle tibia has a row of bristles extending the entire length. These are very short on about the basal half and are moderately developed on the apical half; the longest bristles are about one-fourth greater than the width of the tibia. Middle tibiae with one anterodorsal bristle near basal fifth, another near apical third, and another preapical in position. Hind femur with one well-developed anteroventral and one anterior bristle before the apex; anteroventral surface otherwise with only suberect setae. Hind tibia with one anterodorsal bristle near basal sixth, one near apical third, and one preapical. *Wings*: Comparatively elongate, dusky fumose. Fourth costal section one-half longer than fifth. Last section of vein M_{3+4} two and one-half times longer than m crossvein. *Abdomen*: Black, covered with

gray-brown pollen and with a faint bluish sheen on the dorsum, about equal in length to the thorax.

Length: body, 1.85 mm.; wings, 3.00 mm.

FEMALE. Unknown.

Holotype male: Waikamoi, Maui, 4,000 ft., July, 1956 (R. Namba), collected skating on surface of small pool. One paratype male: same data as type (D. E. Hardy).

Type in B. P. Bishop Museum. Paratype in U. S. National Museum.

***Campsicnemus undulatus* Hardy and Kohn, new species (fig. 38e-g).**

Fitting in the group of species which has the middle basitarsus elongate and lacking ciliation; the middle tibia without truncate posteroventral bristles but with considerable long ciliation, and the front tibia with a dorsal bristle just below the middle. It differs from other species in this complex by having the hind margin of the wing undulated with a distinct indentation at apex of vein M_{3+4} (fig. 38f); by having the middle tibia and tarsus very elongate and slender, the former with a strong anterior bristle at apical third, and, also, by the middle femur lacking long hairs on anterior surface.

MALE. Moderate sized, chiefly yellow species. *Head*: Eyes separated on the face for a length of about one eye facet. Face predominantly yellow-gray pubescent. Front and vertex metallic blue, dusted with gray-brown pollen. First two antennal segments yellow; third segment brown, cone-shaped rather slender-pointed, two times longer than wide. *Thorax*: Predominantly yellow, scutellum, metapleura, and sides of metanotum black; also with a rather broad, brown to black vitta extending down each dorsocentral row. Four pairs of strong dorsocentrals present and one row of moderately strong acrostichals. Halteres yellow. *Legs*: Mostly yellow. Tarsi, outside surface of middle coxa, and apices of tibia, brown to black. All femora slender; front pair with two moderately developed anteroventral bristles at middle of segment. Front basitarsus two-thirds as long as tibia and two times longer than second tarsal segment. Middle femur with about 14 moderately developed anteroventral bristles extending from near base to about apical third of segment (fig. 38e). Middle tibia slender, slightly thickened on basal third (fig. 38g); posteroventral surface with a row of moderately developed, pointed bristles extending from about basal seventh to near apical third of segment; ventral surface with a clump of about ten closely placed bristles near basal seventh of segment, and with long fine ciliation just before the middle of the segment; anterior surface with a clump of fine hairs and about four moderately developed bristles near basal third of segment, also with fine ciliation extending to about apex of segment, beyond the strong bristle at apical third; anterodorsal surface with a row of fine cilia extending from about apical third to basal third of segment. Middle tibia nearly one-third longer than the femur. Middle basitarsus long and slender, about two-thirds as long as the tibia and two times longer

than second tarsal segment. Hind femur devoid of ventral bristles except for a pair at apex. Hind tibia with four anterodorsal bristles and five dorsals. *Wings*: Light fumose. Fourth costal section two times longer than fifth. Veins R_{4+5} and M_{1+2} slightly converging at apices. Last section of M_{3+4} only about one-half longer than m crossvein. Crossvein m slightly curved. Wings otherwise as described above and as in figure 38f. *Abdomen*: Predominantly shining, dark brown to black on the dorsum, rather lightly covered with gray pollen, sternum and sides of terga yellow. Genitalia mostly yellow.

Length: body, 3.5 mm.; wings, 4.0 mm.

FEMALE. Unknown.

Holotype male: Puu Kukui Trail, Maui, 3,000 ft., July, 1956 (R. Namba).

Type in the B. P. Bishop Museum.

***Campsicnemus uniseta* Hardy and Kohn, new species (fig. 39a).**

Fitting near *C. albitarsus* n. sp. because of the strong anteroventral bristle at apical third of hind femur. It is distinguished by having moderately short apical bristles on middle tibia, these but little longer than the middle basitarsus, rather than having one very long, slender apical bristle as in *albitarsus*. Also, the development of the tarsi and other characteristics are very different.

MALE. Rather small, dull-colored species. *Head*: Eyes narrowly separated on the face. At the narrowest point the face is about as wide as one row of eye facets. Face predominantly brown pubescent. Front and vertex submetallic blue-black in ground color, rather thickly brown pollinose. Antennae black, third segment triangular, about one-third longer than wide. *Thorax*: Black in ground color, rather densely brown pollinose on the dorsum, gray on the sides, the dorsum faintly metallic blue. Three pairs of dorsocentrals and no acrostichals present. Halteres yellow. *Legs*: Femora predominantly yellow, tinged lightly with brown; other segments more distinctly brown. Front femur devoid of ventral bristles. Front basitarsus slender, about three-fifths as long as tibia. Front tarsus with short erect setae along ventral surface, these more distinctly developed on the first two segments. Middle femur moderately swollen, attenuated on apical third; anteroventral surface with 8 to 10 black bristles at middle and posteroventral surface with about a dozen hooked, yellow-brown hairs arranged in a row in middle of segment. Middle tibia flattened dorsoventrally, almost straight, with two closely placed ventral bristles near base of segment; anteroventral surface with a clump of moderately developed hairs near basal two-fifths of segment. Posteroventral surface with erect setae extending from basal one-fourth to apex; these become longer as they go distally, and the two apical bristles extend beyond the tip of the basitarsus (fig. 39a). Basitarsus straight, about two-thirds as long as second tarsal segment. Second segment not produced at base but with a bump-like swelling on the anterior surface just beyond base. Hind femur with a strong anteroventral bristle at apical one-third to two-fifths of segment, this about half

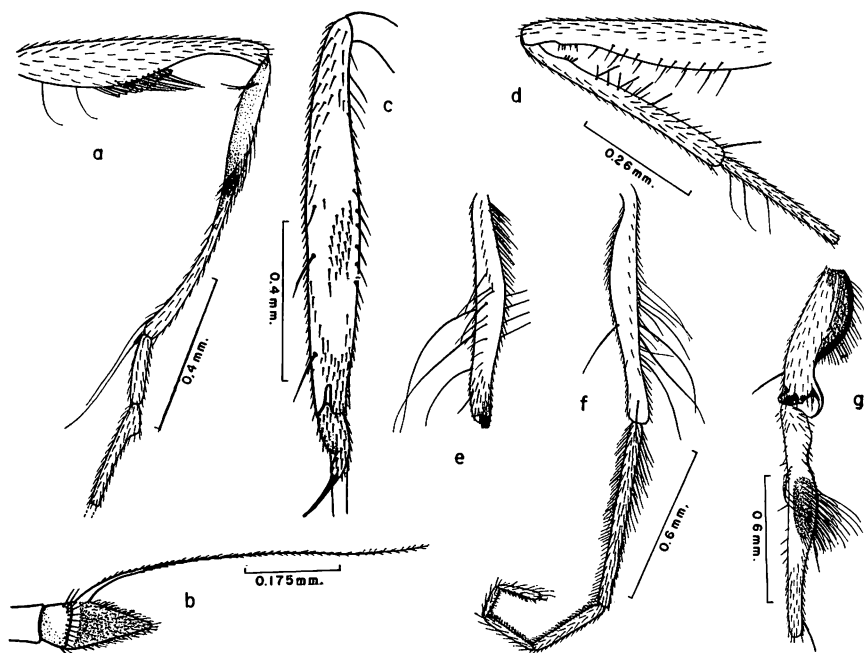


Figure 39—*Campsicnemus uniseta* n. sp.: a, middle femur, tibia, and basal two tarsal segments, anterior view. *C. vafellus* Parent: b, antenna of male; c, middle tibia and basitarsus, dorsal view. *C. viridulus* n. sp.: d, middle femur, tibia, and basitarsus, anterior view. *C. williamsi* Van Duzee: e, front tibia, dorsal view; f, front tibia and tarsus, anterior view; g, middle femur and tibia, dorsal view.

as long as the femur. Hind tibia with erect ventral setae on basal two-thirds of segment. *Wings*: Dusky fumose. Fourth costal cell about one-third longer than fifth. Veins R_{4+5} and M_{1+2} parallel. Last section of M_{3+4} about three times longer than m crossvein. *Abdomen*: Subopaque black, rather densely covered with gray-brown pollen.

Length: body, 1.25 mm.; wings, 1.85 mm.

FEMALE. Fitting the description of the male except for secondary sexual characters. The face is about equal in width to two rows of eye facets. The third antennal segment is more blunt at apex and is about as wide as long.

Length: body, 1.5 mm.; wings, 2.0 mm.

Holotype male and allotype female: Waikamoi, Maui, 4,000 ft., July, 1956 (D. E. Hardy). Eighteen paratypes (11 males and 7 females): mostly same data as type; also from Kula Pipeline, above Waikamoi, Maui, 4,200 ft., July, 1956 (D. E. Hardy and R. Namba).

Type, allotype, and a series of paratypes in the B. P. Bishop Museum. Remainder of paratypes in the following collections: U. S. National Museum,

British Museum (Natural History), Hawaiian Sugar Planters' Association, and the University of Hawaii.

Campsicnemus vafellus Parent (fig. 39b–c).

Campsicnemus vafellus Parent, 1939, Proc. Haw. Ent. Soc. 10:233, figs. 18–19.

Endemic. Oahu (type locality: Mt. Olympus, 2,300–2,400 ft.). Known only from the Koolau Mountains.

Type in the British Museum (Natural History). One male and one female marked cotypes, plus specimens from "Olympus," in Parent collection, Museum National d'Histoire Naturelle, Paris. Also two topotypic specimens in the Hawaiian Sugar Planters' Association collection.

Fitting in the group which has the middle basitarsus short and armed with a spine but the middle tibiae not flattened. It differs from other species in this complex by having the middle basitarsus extended apically about its own length before the spur; apical spur straight and long, about three-fourths as long as the basitarsus including the extended portion; length of basitarsus from base to insertion of second segment about one-fifth the length of the following segment. Tibia only slightly thickened, with a patch of short setae just below the middle and with two well-developed posterodorsal bristles, one on apical fifth and one just below middle of tibia (fig. 39c).

Antennae yellow, tinged with brown, third segment pointed, about one-half to two-thirds longer than wide. Thorax entirely yellow to reddish yellow, sometimes slightly discolored with brown on the mesonotum. Legs entirely yellow except for brown discoloration on middle coxae and on all tarsi. Middle femur with ventral bristles extending from about basal fourth to apical fourth, these becoming shorter and more stubby distally. Other details of middle legs as described above, and as in figure 39b. Wings hyaline or nearly so.

Length: body, 2.0 mm.; wings, 2.4 mm.

Campsicnemus viridulus Hardy and Kohn, new species (fig. 39d).

Fitting in the group of species which has a long middle basitarsus and a metallic green mesothorax. It is near *C. norops* n. sp. but differs by lacking a dorsal bristle on middle tibia and by having long cilia on the middle basitarsus.

MALE. Head: Eyes joined on face for a distance equal to about four eye facets, lower portion of face densely yellow-gray pubescent. Front and vertex metallic green, lightly pollinose. Antennae predominantly yellow, tinged with brown at apex of third segment, third segment subacute at apex about one-half longer than wide. **Thorax:** Predominantly metallic green, faintly coppery in some lights. The pleura are densely gray pollinose, the mesonotum lightly brown pollinose. Three pairs of dorsocentral bristles and one row of acrostichals present; the latter are present only on the anterior third of the mesonotum. Halteres yellow. **Legs:**

Almost entirely yellow. Front femur slender, lacking ventral bristles. Front tibia and tarsus without ornamentation. Middle femur slender, with a row of moderately well-developed posteroventral bristles extending from near basal third to near apex of segment and with several short preapical bristles on this surface; anteroventral surface with about six short bristles on apical half. Middle tibia rather short and straight; posteroventral surface with a row of moderately developed, truncate bristles extending over basal three-fifths of segment; ventral surface with a small clump of short bristles just beyond base and several rather short, truncate bristles before the middle of the segment (fig. 39d). Middle basitarsus with three moderately long posterodorsal cilia on basal half of segment, basitarsus about three-fifths as long as tibia and two times longer than second tarsal segment. Hind femur lacking ventral bristles. *Wings*: Slightly dusky. Fourth section of costa about one-half longer than fifth. Last section of M_{3+4} slightly over three times longer than m crossvein. *Abdomen*: Dark brown to black in ground color covered with gray-brown pollen but with a distinct coppery sheen in direct light.

Length: body, 1.15 mm.; wings, 1.60 mm.

FEMALE. Fitting the characteristics of the male except for secondary sexual characters; the face is about two facets wide at its narrowest point and entirely gray pollinose; the third antennal segment is obtuse and a little longer than wide.

Holotype male and allotype female: Kula Pipeline, above Waikamoi, Maui, 4,200 ft., July, 1956 (R. Namba). One paratype male: same data (D. E. Hardy).

Type and allotype in B. P. Bishop Museum. Paratype in the U. S. National Museum.

***Campsicnemus williamsi* Van Duzee (fig. 39e-g).**

Campsicnemus williamsi Van Duzee, 1933, Proc. Haw. Ent. Soc. 8:328, figs. 60-62.

Campsicnemus octosetosus Van Duzee, 1933, Proc. Haw. Ent. Soc. 8:322, figs. 40-42. **New synonymy.** The type (Hawaiian Sugar Planters' Association collection) is a female, not a male. One of the paratypes is a male and is the same as *williamsi*. Page priority is not being followed because of the error in recognizing the sex of the type of *octosetosus*.

Campsicnemus obtusus Van Duzee, 1933, Proc. Haw. Ent. Soc. 8:321, figs. 37-39. **New synonymy** based upon comparison of the type (Kaala, Wai-anae, Oahu, in the Hawaiian Sugar Planters' Association collection) with the type, allotype, and a series of *C. williamsi*. The type of *obtusus* is a female; Van Duzee was in error in considering one of the six specimens before him as a male. These are obviously the same species that he later (*op. cit.*, page 328) described as *C. williamsi*. The latter name is being used since its type was a male.

Endemic. Oahu (type locality: Mt. Kaala, "on boggy poollet," 4,000 ft.). It

occurs in both the Waianae and Koolau mountains. A water skater, found on the surface of small pools in the mountains, 2,000–4,000 ft.

Type in the Hawaiian Sugar Planters' Association collection.

Distinguished from all other known *Campsicnemus* by the peculiar hooklike development at apex of middle femur (fig. 39g) by the structure of the middle tibia, and by the long dorsal bristles on the front tibia (fig. 39e).

The species has been adequately described by Van Duzee. The thorax is subshining dark brown to black down the median portion of the mesonotum and over the scutellum and is yellow-red on the sides of the mesonotum, the humeri, and most of the pleura. Legs predominantly yellow, structures of the front tibia and middle legs as in figure 39e–g; the middle tibia has a polished area at middle extending down anterodorsal surface, immediately above the dense clump of anterior and anteroventral bristles (fig. 39g).

Length: body, 2.6 mm.; wings, 3.2 mm.

Van Duzee's description is good.

Genus **EURYNOGASTER** Van Duzee

Eurynogaster Van Duzee, 1933, Proc. Haw. Ent. Soc. 8:339.

Sweziella Van Duzee, 1933, Proc. Haw. Ent. Soc. 8:346.

Uropachys Parent, 1935, Encyclopedia Entom. 8:80. Change of name for *Pachyurus* Parent, 1934, Mem. Soc. Nat. et Math. de Cherbourg 41:305. *Nec Pachyurus* Agassiz, 1831, in Spix. Pisc. Brazil, 127. **New Synonym.**

Uropachys was placed in the subfamily Hydrophorinae by Parent because of the lack of a prescutellar depression. It is obviously the same as that which Grimshaw (1901:13) listed as " ? Gen. Nov. et sp." Grimshaw's specimen is probably the same male specimen which Parent used as the type of *Pachyurus hawaiiensis*; the data on each were exactly the same. Grimshaw, however, said the specimen possessed a distinct prescutellar depression and six scutellar bristles. Parent said there were two scutellar bristles and no prescutellar depression. The species at hand has the distinct prescutellar bristles and has two strong and four weak scutellar bristles and would seem to fit better in the subfamily Campsicneminæ than in Hydrophorinae. The genotype of *Pachyurus (hawaiiensis)* Parent has been studied in the British Museum collection by H. Oldroyd, and he confirms that it has a prescutellar depression and two strong plus four small scutellars. It is obviously a *Eurynogaster* and is no doubt the same specimen recorded by Grimshaw.

Fitting closer to *Campsicnemus* Haliday than to any other Hawaiian genus; differing by having the m crossvein longer than the last section of vein M_{3+4} , by lacking acrostichals, and by having the male genitalia comparatively well developed (fig. 44f). The genus is known only from Hawaii.

As pointed out by Williams (1939:297) the flies of this genus "are usually upland or forest species. The ones that occur along streams, waterfalls, wet boulders bordering rapids, at springs and dripping wet banks are largely brilliant blue, green or coppery, while those frequenting the forest floor or trails and often the leaves of plants, are of duller hues."

Type of genus: *Eurynogaster clavaticauda* Van Duzee.

KEY TO THE SPECIES OF EURYNOGASTER, BASED UPON MALES

1. Fourth abdominal tergum produced into a ventral process on each lateral margin.....2
 Lateral margins of fourth tergum without a noticeable ventral process.....6
- 2(1). Abdomen in lateral view not indented or angulate at the fourth abdominal segment. Hind margin of fourth tergum straight, not concave.....3
 Hind margin of fourth abdominal tergum concave, the dorsum reduced to a narrow strip about one-fifth the length of the preceding segment; abdomen angulate at this point. Cerci well developed *in situ*, the lower angle produced into a long, slender, slightly curved process (fig. 59c). Middle femur with well-developed bristles near base, three long bristles surrounded by several short bristles (fig. 59b). (Oahu).....*virida* Van Duzee.
- 3(2). Middle femur with ventral bristles on entire length.....4
 Middle femur with only three long, pale bristles near base. (Molokai).....*tergoprolixa* n. sp.
- 4(3). Middle femur with heavy, blunt ventral bristles; the basal ones not distinctly longer than the rest. Middle tibia without a series of anterior bristles; ventral series composed of short bristles terminating in a longer and thicker apical bristle.....5
 Middle femur with ventral bristles near base two times longer than other bristles of the series. Middle tibia with a row of anterior bristles and a row of ventral bristles. (Mt. Kaala, Oahu).....*conspicua* n. sp.
- 5(4). Middle femur with more than one row of ventral bristles; the posteroventral series being the longest,

- nearly as long as the width of the femur, the bristles in each preceding row successively shorter. Posterior femur with a row of anteroventral bristles. (Mt. Kaala, Oahu).....*aeruginosa* n. sp.
- Middle femur with but a single row of ventral bristles, these almost as long as width of femur. Posterior femur without anteroventral bristles. (Oahu)
.....*gracilipennata* n. sp.
- 6(1). Abdomen greatly enlarged at apex, genital segments 1.5 to 2 times greater than the base of the abdomen. Each cercus developed into a horny process with thick, spinose bristles at apex and not embedded into genital chamber (fig. 55b).....7
- Abdomen not so greatly enlarged.....12
- 7(6). Femora dark brown to black with green metallic sheen; strong posteroventral bristles lacking on front femur (except in *parenti* which has two).....8
- Legs predominantly yellow, except for a slight brownish discoloration at apices of femora. Front femur with an irregular series of anteroventral bristles, the ones nearer the base being about one-third the width of the femur; also with three or four distinct posteroventral bristles, the longest being about two-thirds the width of the femur. Base of middle femur with four anteroventral and two ventral bristles which are better developed than others on femur. Cercus about one-half the length of the ninth segment and without a long stem, apical portion longer than base (fig. 48c). (Kauai mountains).....*flavicrura* n. sp.
- 8(7). Femora dark, tibiae predominantly yellow.....9
- Femora and tibiae entirely dark colored.....10
- 9(8). Front femur with basal two bristles of ventral series distinctly longer than rest. Cercus stout, without a distinct narrow stem; the widest portion of the cercus is about one-third its length (fig. 55b). (Kokee region, Kauai).....*parenti* n. n.
- Front femur without long basal bristles and with short ventral bristles on apical two-thirds. Hind femur with fine ventral bristles on entire length. Cercus

with a long stem; the width of the apical, clavate portion is about one-third the length of the stem (fig. 45b). (Kokee area, Kauai).....*clavastyla* n. sp.

- 10(8). Cerci elongate, each with a narrow stem and clavate at apex, about as long as the ninth abdominal segment and extending over the fourth to about the middle of the third segment. Middle femur with three long ventral bristles at base, the middle one being the longest; the anteroventral bristles are very short and extend to apex of segment; posteroventral bristles are developed only on apical third of segment. Halteres dark brown. (Kauai mountains)*fusticercus* n. sp.

Cerci about one-half the length of the ninth segment and not extending to the third abdominal segment. Middle femur with more than three, usually five to six, long ventral bristles near base. Halteres yellow11

- 11(10). Apex of cercus as wide as base, slightly constricted in middle; upper apex of cercus with three flat bristles, the uppermost bristle bent inward; the lower corner with two thick bristles. Base of cercus with short hairs (fig. 46h). (Kokee region, Kauai).....*crassicercus* n. sp.

Apex of cercus much narrower than base. Bristles on cercus placed in three distinct groups—three on uppermost apex, the top bristle straight, not bent inward, two bristles present on lower median corner, and about five present near the basal one-half (fig. 54h). (Alakai Swamp, Kauai).....*palustricola* n. sp.

- 12(6). Front femur with prominent ventral bristles extending its entire length, or with short, stout ventral spines (fig. 52c).....13
Front femur devoid of ventral bristles or spines except for a few short anteroventral bristles near base in *pulverea* n. sp.....22

- 13(12). Front femur with short, stout spines on venter.....16
Front femur with fine ventral bristles.....14

- 14(13). Fourth abdominal segment without a ventral projection. Third antennal segment one-half longer than wide, arista thickened at apex (fig. 52b). Front

- femur with short, fine ventral bristles. Front tarsus with fine ciliation. Middle tibia straight, with short, fine ventral ciliation. (Oahu and Kauai) . **minor** (Parent).
 Fourth abdominal segment with a ventral projection.
 Third antennal segment about as long as wide, arista normal. Front femur with moderately long bristles. Front tarsus without marked ciliation. Middle tibia slightly sinuous15
- 15(14). Middle femur without ventral bristles. Projection from fourth abdominal sternum lanceolate (fig. 42c). (Koolau Mountains, Oahu).....**binodata** Parent.
 Middle femur with a row of ventral bristles. Projection from fourth abdominal sternum capitate at apex (fig. 43e). (Kohala Mountains, Hawaii).....
**bullata** n. sp.
- 16(13). No sternal projection on fourth abdominal segment. Front tibia with two well-developed dorsal bristles; ventral surface with short, fine bristles on entire length. Middle femur with a row of short, blunt spines on midventral section. (Oahu)
**obscurifacies** Parent.
 Fourth abdominal sternum with a projection. Front tibia without dorsal bristles17
- 17(16). Sternal projection on fourth abdominal segment long, lancet-shaped18
 Sternal projection on fourth abdominal segment small, short and hook-like19
- 18(17). Front femur with six to eight short spines on anteroventral surface and with no posteroventral bristles. Middle and hind femora without ventral bristles. (Mt. Kaala, Oahu).....**nigrohalterata** Parent.
 Front femur with ten short, anteroventral spines and with three or four strong bristles on the median posteroventral surface. Middle and hind femora with distinct ventral bristles. (Molokai).....
**multispinosa** n. sp.
- 19(17). Halteres clear yellow.....20
 Halteres brownish yellow to dark brown.....21
- 20(19). Legs yellow-brown to dark brown or black, with a distinct metallic green luster. Front femur with

- six to eight well-developed anteroventral spines. Middle femur with about sixteen short, rather stout posteroventral bristles. (Waianae Mountains, Oahu).....**saxatilis** (Grimshaw).
- Legs predominantly yellow, not metallic green. Front femur with four well-developed anteroventral bristles, plus one or two tiny preapical bristles. Middle femur with about twelve thin, rather hair-like posteroventral bristles (Oahu mountains).....**viridifacies** Parent.
- 21(19). Front femur with ten to twelve spines on anteroventral surface and with four to six spines on posteroventral surface near middle of segment. Middle tibia straight. (Molokai).....**hamata** n. sp.
- Front femur with four to five black spines on anteroventral surface and with two median posteroventral bristles. Middle tibia slightly sinuate. (Maui).....**exartema** n. sp.
- 22(12). Hind femur with long ventral ciliation; some of the cilia are equal or greater in length than the width of the femur (fig. 56b).....23
- Hind femur without such ciliation, in *subciliata* n. sp. with a row of posteroventral hairs but these are much shorter than width of femur.....24
- 23(22). Halteres yellow. Middle femur with a preapical bump on venter (fig. 56c). Middle tibia swollen at basal third. Hind femur with cilia and bristles as in figure 56b. (Oahu mountains).....**retrociliata** Parent.
- Halteres with brown knobs. Middle femur and tibia not as above. Hind femur as in figure 44e. (Koolau Mountains).....**cilifemorata** Parent.
- 24(22). Femora and tibiae entirely clear yellow, or at most with hind tibiae dark or with a brown discoloration at apex of hind femur.....25
- Legs entirely dark or with at least femora predominantly dark37
- 25(24). Pleura dark brown or metallic, dusted with pollen.....26
- The lower half of each pleuron yellow.....35
- 26(25). Apex of hind femur dark brown. No strong ventral bristles on middle femur. Face metallic, without dense gray pubescence.....33

- Apex of hind femur with not more than a slight brownish discoloration. Middle femur with well-developed ventral bristles. Face covered with gray pubescence.27
- 27(26). Third antennal segment conical, elongate, three times as long as wide. Middle femur with three ventral bristles on basal half; the distal bristle of the set is two times longer than the basal two bristles; apical half of middle femur with four short ventral bristles (fig. 57f). (Molokai).....**tancyraea** n. sp.
Third antennal segment not elongate. Leg bristling not as above28
- 28(27). Front femur with a row of four posterior bristles near apex. Middle femur with about thirteen ventral bristles, the fourth from the base being the best developed. Middle tibiae straight, not distinctly ciliated (fig. 54e). (Kauai)**paludis** n. sp.
Front femur without apical bristles on posterior surface. Leg chaetotaxy not as above.....29
- 29(28). Ventral bristles of middle femur confined to median portion, not extending beyond apical third of segment.32
Ventral bristles on middle femur extending approximately to the apical one-fifth of segment.....30
- 30(29). Middle tibia with but one well-developed ventral bristle at apex. Middle femur with eight to nine ventral bristles, the second bristle from base is more than two times longer than the others (fig. 50i). (Mt. Kaala, Oahu).....**incompta** n. sp.
Middle tibia with more than one well-developed ventral bristle. Basal two bristles on middle femur subequal in length and longer than the other bristles in the series.....31
- 31(30). Hind femur with distinct anteroventral hairs. Front coxae yellow. (Oahu)**subciliata** n. sp.
Hind femur without distinct anteroventral hairs. Front coxae dark, concolorous with pleura. (Hawaii)**hawaiiensis** (Grimshaw).
- 32(29). Middle tibia slightly sinuate, with a row of anteroventral bristles just above the middle and with a cluster of short ventral bristles at apex (fig. 45f). (Oahu).....**clavaticauda** Van Duzee.

- Middle tibia straight, lacking anteroventral bristles or a cluster of ventral bristles at apex. Front femur with several small anteroventral bristles near base. (Kauai)..... **pulverea** n. sp.
- 33(26). Middle tibia lacking anteroventral bristles. Tarsi long and slender, front tarsus about two times longer than tibia; middle basitarsus about three-fourths as long as tibia. Middle femur lacking fine ventral bristles. (Oahu) **nudata** n. sp.
 A strong anteroventral bristle present on apical third to fourth of middle tibia. Front tarsus about one-third longer than tibia and middle basitarsus about one-half as long as tibia. Middle femur with some fine, erect, anteroventral bristles..... 34
- 34(33). Middle tibia with rather long ciliation along entire anteroventral surface; some of these hairs are at least two times longer than the width of the tibia. Hind tibia yellow with four anterodorsal bristles. Tarsi brownish yellow. Bristles of pronotum yellow. (Oahu)..... **apicenigra** Parent.
 Middle tibiae lacking long ciliation on anteroventral surface. Hind tibia and tarsus black. Bristles of pronotum black. Hind tibia with five pairs of anterodorsal bristles and with a small bristle developed just beyond base of segment. (Maui).....
 **nigripedis** n. sp.
- 35(25). Hind femur entirely yellow. Upper portions of pleura metallic green, overcast with brown pollen..... 36
 Apex of hind femur with a brown discoloration. Pleura, lateral margins of mesonotum, and abdomen yellow. Middle femur as in figure 60f. (Kauai) **xanthopleura** n. sp.
- 36(35). Mouthparts elongate, two-thirds as long as head. Middle femur with a row of about eleven posteroventral bristles, the basal four or five are heavier than the others. Ventral surface of middle tibia covered with very fine pubescence (fig. 47a). (Kauai)
 **dolichostoma** n. sp.
 Mouthparts short, about one-third as long as head. Middle femur with four widely spaced posteroventral bristles on basal two-thirds and with a

- series of four shorter bristles on apical one-third
(fig. 48e). (Hawaii) **flaviventer** n. sp.
- 37(24). Wings infuscated with brown at apex. Venter of middle femur with two long, black bristles at basal fourth plus a row of very closely spaced flat, blunt bristles (about ten, five of which are matted together) at basal two-thirds; also with four shorter, slender, bristles near middle of segment (fig. 51c). (Oahu, Hawaii, and Molokai) **maculata** Parent.
Wings hyaline or evenly tinged with brown. Chaetotaxy not as above 38
- 38(37). Mesonotum with three brown and two gray vittae extending the entire length. (Maui) **vittata** n. sp.
Mesonotum not vittate 39
- 39(38). Face, thorax, and abdomen densely covered with silvery pubescence. Femora dark brown to black, tibiae brownish yellow. (Hawaii) **argentata** n. sp.
Body not covered with silvery pubescence 40
- 40(39). Face metallic. Middle femur lacking strong ventral bristles near base, only slender bristle-like hairs present along anteroventral surface; the apical bristles on the lower posterior surface of middle femur are sometimes more strongly developed than the other setae. Abdominal segments each with a ring of strong bristles, plus an abundance of suberect setae. 41
Face gray pubescent. Some strong basal bristles developed on venter of middle femur. Abdomen not so densely bristled. 42
- 41(40). Legs all black. About five anteroventral hairs present in a row near middle of mid femur (fig. 50g). No anteroventral bristles or erect ventral setae present on middle tibia. (Hawaii) **hispida** n. sp.
Ventral portions of all femora yellow. Anteroventral hairs of middle femur extending entire length of segment. A strong anteroventral bristle present at apical third of middle tibia and ventral surface of tibia densely covered with erect setae (fig. 60c). (Molokai) **williamsi** n. sp.
- 42(40). Ventral bristles of middle femur arranged on apical two-thirds of segment (fig. 40g). (Kauai)
..... **angustifacies** n. sp.

- Ventral bristles not extending to apex of segment and usually ending near middle.....43
- 43(42). Anterior bristle of middle tibia situated near or above middle of segment, separated from dorsal bristle by about one-fourth to one-fifth the length of the tibia.....44
- Anterior bristle situated at apical third of middle tibia, separated from the dorsal bristle by half the length of the segment. Bristles of middle femur as in figure 57b. (Maui and Lanai).....**spiniger** (Grimshaw).
- 44(43). Posteroventral surface of middle femur with four strong bristles situated at basal third, followed by about eight short bristles; the fourth bristle from the base of the segment is the strongest (fig. 44a). Face narrow, three eye facets wide. (Maui).....**callaina** n. sp.
- Posteroventral surface of middle femur with two strong basal, plus the smaller bristles. Face four to six facets wide at narrowest point.....45
- 45(44). Middle tibia with a row of three or more strong anteroventral bristles; these are larger than the anterior bristles; apex of tibia with a cluster of short ventral bristles. Third antennal segment about as wide as long.....46
- Not more than two anteroventral bristles present on middle tibia; these are smaller than the anterior bristles; apex not enlarged and without a ventral clump of stout setae. Third antennal segment two times longer than wide. (Hawaii, Molokai, Oahu, and Maui).....**variabilis** n. sp.
- 46(45). Entire mesonotum gray, faintly metallic blue or green. Middle femur with two long posteroventral bristles near basal third, plus five or six shorter bristles extending in a continuous row to apical third (fig. 48g). (Molokai and Maui).....**furva** n. sp.
- Hind portion of mesonotum brownish pollinose. Posteroventral surface of middle femur with the two longest bristles situated near basal one-fifth to one-sixth of the segment, followed by two to four short bristles, then a space and three tiny bristles situated just beyond middle of segment (fig. 51a). (Kauai).....**kauaiensis** n. sp.

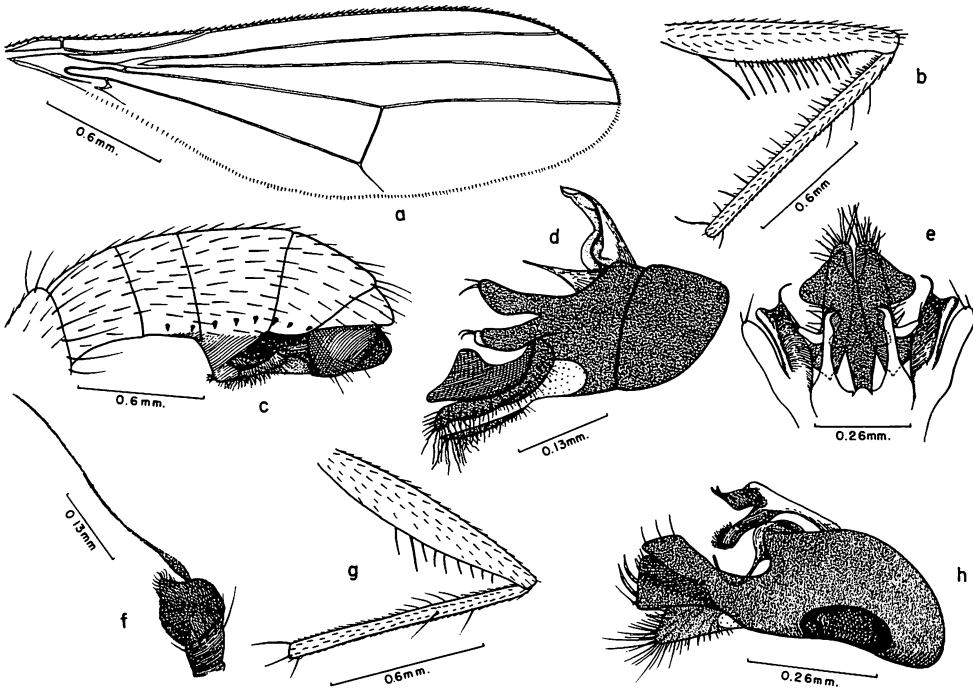


Figure 40—*Eurynogaster aeruginosa* n. sp.: a, wing; b, middle femur and tibia; c, abdomen of male, lateral; d, male genitalia, lateral; e, male genitalia, ventral. *E. angustifacies* n. sp.: f, antenna; g, middle femur and tibia; h, male genitalia, lateral.

***Eurynogaster aeruginosa* Hardy and Kohn, new species (fig. 40a–e).**

Fitting in the group of species which has the lateral margins of the fourth tergum of male produced ventrally, the hind margins of fourth tergum straight, and the middle femora with thick, blunt, ventral bristles the entire length. Related to *E. gracilipennata* n. sp. but differing by having three or more rows of ventral bristles on middle femora (fig. 40b), by the presence of a row of anteroventral bristles on hind femur, as well by the very different development of the male genitalia (fig. 40d–e).

MALE. A moderate-sized, submetallic species. *Head:* Face densely gray pubescent; very narrow, at its narrowest point scarcely wider than one row of eye facets. Front gray below, brown above. Vertex brown, faintly metallic green. Occiput entirely gray. Antennae brown, tinged with yellow on the basal segments, third segment as wide as long, rounded at apex. Arista subapical, short pubescent, about two and one-half times longer than remainder of antenna. *Thorax:* Metallic green to coppery in direct light, rather thickly brown pollinose over most of the mesonotum; the margins are gray. The scutellum and pleura are entirely gray pollinose with a distinct greenish sheen. Halteres clear yellow. *Legs:* Pre-

dominantly yellow. Middle and hind coxae tinged with brown and covered with gray pollen; hind femora and tibiae brownish on the apical portions, apical segments of tarsi yellow-brown. Front coxae nearly bare above except for the dark bristles at apex, with only scattered pale hairs on the dorsal surface. Front femora and tibiae without conspicuous bristles or hairs. Each middle femur with a row of long, blunt, posteroventral bristles extending from basal third to apex, and with about two rows of short ventral bristles extending from near middle to apex. Each middle tibia with a row of erect ventral bristles extending the entire length of the segment, these increasing gradually in size to the apex; the apical bristle is slightly curved and is over two times longer than the width of the segment. No anterior bristle is present on middle tibia except at apex. Each hind femur with a row of moderately developed anteroventral bristles extending from about the basal third to about apical third of segment. *Wings*: Faintly brownish fumose. Cell R_5 slightly narrowed apically. Fourth section of costa one-half longer than fifth. Last section of vein M_{3+4} about two-thirds as long as m cross-vein (fig. 40a). Anal lobe reduced, poorly developed. *Abdomen*: Metallic green or bronze in ground color, dusted with brownish gray on the dorsum, gray on the sides. Anterior lateral margins of fourth tergum developed into capitate projections which extend ventrally (fig. 40c). Genitalia very well developed, the cerci long and slender, densely pilose (fig. 40d-e).

Length: body and wings, 3.2 mm.

FEMALE. Lacking the distinctive bristles on the legs and with the face rather broad, about equal in width to eight or nine rows of eye facets; otherwise similar to the male.

Length: body, 2.7 mm.; wings, 3.3 mm.

Holotype male, allotype female, and two male paratypes: Mt. Kaala, Oahu, 2,500–3,000 ft., May 18, 1920 (Timberlake).

Type and allotype in the B. P. Bishop Museum. Paratypes in the U. S. National Museum and the University of Hawaii collections.

***Eurynogaster angustifacies* Hardy and Kohn, new species (fig. 40f-h).**

Fitting close to *E. variabilis* n. sp. but differing by having the ventral bristles of the middle femur arranged on the apical two-thirds of the segment rather than before the middle, by having the third antennal segment short, and by the face being rather strongly narrowed below.

MALE. Rather small, chiefly dark-colored species. *Head*: Face gray, narrowed to three or four rows of eye facets on the lower portion. Front and vertex brown. Antennae black, third segment as wide as long. Arista subapical (fig. 40f), about two and one-half times longer than remainder of antenna. *Thorax*: Brownish gray, faintly bronze on the dorsum, gray on the sides. Halteres clear yellow. *Legs*: Front coxae brownish yellow, other coxae brown, densely covered with gray pollen; femora dark brown to black; tibiae yellow; tarsi chiefly brown. Front and

hind legs without ventral bristles or long hairs. Each middle femur with a row of posteroventral bristles extending from about the basal two-fifths almost to the apex of the segment, the two basal bristles are the largest, about nine bristles are present in the posteroventral row. Anterior bristle of middle tibia situated just above the middle (fig. 40g); a row of three or four rather well-developed posteroventral bristles are situated just slightly below the middle of the segment. Tibia straight without a ventral brush at apex. *Wings*: Slightly dusky fumose. Veins R_{4+5} and M_{1+2} approximately parallel. Fourth costal section about two-thirds longer than the fifth. Last section of M_{3+4} equal in length to the m crossvein; m crossvein straight. *Abdomen*: Rather densely gray on the sides, brownish gray on the dorsum, faintly metallic bronze. Genitalia as in figure 40h.

Length: body and wings, 2.3–2.5 mm.

FEMALE. Similar to the male except lacking the bristles on the middle legs. The mesonotum is more densely gray pollinose and the face is rather broad, equal in width to about ten rows of eye facets.

Holotype male and allotype female: Kalalau Lookout, Kauai, 4,000 ft., August, 1953 (D. E. Hardy). Sixteen paratypes (ten females and six males) from the following localities on Kauai: Poomau Val., 3,400 ft., July, 1952 (D. E. Hardy); Mohihi River, 3,500 ft., August, 1953 (D. E. Hardy); Koaie Stream, August, 1953 (D. E. Hardy); Nualolo Val., 3,400 ft., July, 1952 (D. E. Hardy); Waialeale Stream, 3,600 ft., August, 1953 (D. E. Hardy); and Summit Camp, April 23, 1922 (O. H. Swezey).

Type and allotype in the B. P. Bishop Museum. Paratypes distributed among the following collections: U. S. National Museum, British Museum (Natural History), Hawaiian Sugar Planters' Association, State Department of Agriculture, and the University of Hawaii.

***Eurynogaster apicenigra* Parent (fig. 41a–b).**

Eurynogaster apicenigra Parent, 1939, Proc. Haw. Ent. Soc. 10:240, fig. 20.

Endemic. Oahu (type locality: Mt. Kaala, 3,000 ft.). This species occurs in both the Waianae and Koolau Mountains, it is apparently rather rare.

Type in the British Museum (Natural History).

Fitting in the group of species which lacks ventral spines or bristles on front femora, or projections from lateral margins of fourth tergum of male; which has the legs predominantly yellow and only apices of hind femora brown; and the pleura entirely dark in ground color, and face metallic without velvety-white pubescence. It appears closest related to *E. nigripedis* n. sp. but differs by having long anteroventral ciliation on middle tibia (fig. 41a), and the hind tibia yellow.

Rather brightly metallic green, blue, or purple on the mesonotum, abdomen, front, and face. Legs predominantly yellow, ciliation of middle legs as in figure 41a. Halteres bright yellow, wings pale brown fumose. Cell R_5 slightly narrowed apically. Fifth costal section about two-thirds as long as fourth. Last section of

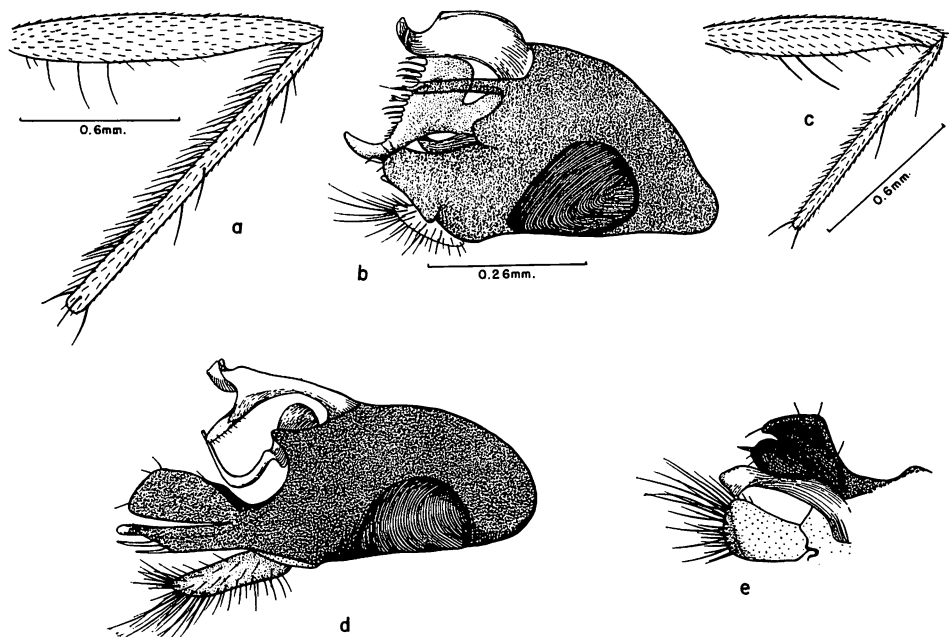


Figure 41—*Eurynogaster apicenigra* Parent: a, middle femur and tibia; b, male genitalia, lateral. *E. argentata* n. sp.: c, middle femur and tibia; d, male genitalia, lateral; e, male genitalia, inner view showing clasper.

M_{3+4} slightly shorter than m crossvein. Male genitalia as in figure 41b.

Length: body, 2.4–2.7 mm.; wings, 3.0–3.2 mm.

***Eurynogaster argentata* Hardy and Kohn, new species (fig. 41c–e).**

This species is distinguished from all other known *Eurynogaster* by having the face, front, thorax, and abdomen entirely covered with dense silvery pubescence.

MALE. Head: Entire median portion of the head, including vertex and palpi, is densely silvery pubescent; the labella are dark brown. Face rather broad; at its narrowest point it is about equal to seven rows of eye facets. First two antennal segments dark brown, third black, slightly longer than wide. Arista subapical, about half to two-thirds longer than remainder of antenna. **Thorax:** Entirely silvery, except for a brown spot in the prescutellar depression and in the median portion of the scutellum. Halteres bright yellow. **Legs:** Predominantly brown to black, tibiae chiefly yellow, apices of hind tibiae brown, and femora all black except for extreme apices, which are yellow. Front and hind legs without strong ventral bristles or long hairs. Each middle femur with two strong posteroventral bristles near the middle plus a row of about six short black bris-

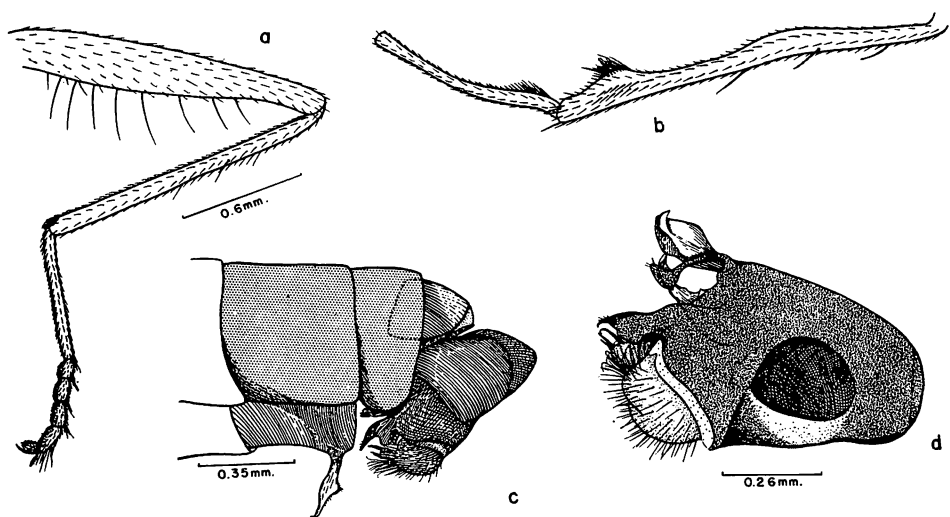


Figure 42—*Eurynogaster binodata* Parent: a, front leg; b, middle tibia and basitarsus; c, apex of abdomen, lateral; d, genitalia of male, lateral.

gles extending to apex (fig. 41c). Middle tibiae straight. *Wings*: Faintly brown fumose. Cell R_5 slightly narrowed apically. Fourth costal section about one-half longer than fifth. Last section of M_{3+4} about three-fourths as long as m crossvein. Crossvein m slightly convex. *Abdomen*: Entirely silvery, genitalia dark brown to black. Structures as in figure 41d-e.

Length: body, 2.7 mm.; wings, 2.9 mm.

FEMALE. Unknown.

Type male: Bird Park, Kilauea, Hawaii, August, 1952 (D. E. Hardy). Six male paratypes from the following localities: Olaa Flume Road, August, 1952, 1,800 ft. (W. C. Mitchell); Upper Olaa Forest, August, 1952 (W. C. Mitchell); Hawaii National Park, 4,000 ft., October, 1946, and August to September, 1952 (D. E. Hardy, H. A. Bess, and C. J. Davis) (one specimen taken at light); and Kaiholena Ridge, Hawaii, August, 1952, 2,300 ft. (W. C. Mitchell).

Type and one paratype in the B. P. Bishop Museum. The remainder of the paratypes in the following collections: U. S. National Museum, Hawaiian Sugar Planters' Association, and the University of Hawaii.

***Eurynogaster binodata* Parent (fig. 42a-d).**

Eurynogaster binodata Parent, 1939, Proc. Haw. Ent. Soc. 10:241, figs. 21-23.

Endemic. Oahu (type locality: Kuluanui Stream, 2,000 ft.). To date it has been taken only in the Kuluanui area, Koolau Mountains. Williams said it is "uncommon, local and difficult to catch."

Type in the British Museum (Natural History).

Two males and one female co-types are in the Parent collection in the Museum National d'Histoire Naturelle, Paris, none is labeled type; one of these males should be the type, the data are the same as recorded by Parent.

Belonging in the group of species which has ventral bristles on the front femora. Differing from related species by having a lanceolate ventral projection on the fourth abdominal sternum of male; front femora with moderately long ventral bristles; front tarsi lacking distinct ciliation (fig. 42a); middle tibiae sinuous; and middle femora without ventral bristles.

Dark-legged, metallic green to partially purple species with distinctive genitalia in the males (fig. 42c-d) and ornamentation of the legs (fig. 42a-b). The middle tibiae are slightly swollen just below middle and before apex, and each has a dense patch of black setae on the preapical swelling (fig. 42b). The anterior coxae are devoid of bristles except at apex and except for a group of fine anterodorsal bristles near base. The third antennal segment is about as wide as long. The male genitalia and the development of the middle tibia of the male show apparent relationship to *E. bullata* n. sp., but the latter species has a distinct bulla on wings of male, the middle femora bristled, and the appendage on the fourth sternum is capitate.

Eurynogaster bullata Hardy and Kohn, new species (fig. 43a-g).

Apparently related to *E. binodata* Parent from the Koolau Mountains, Oahu. It is more stoutly built, however, and differs by the males having an elongate black bulla along vein M_{3+4} (fig. 43a); middle femora with ventral bristles; front coxae with numerous dorsal bristles; middle tibiae more strongly swollen before the apex (fig. 43g); and the last section of vein M_{3+4} about equal in length to m crossvein rather than less than half as long as m. Also the m crossvein is straight, not convex.

MALE. Head: Front and face metallic green to blue-green, face rather broad, the width is equal to six to eight rows of eye facets. Ocellar bristles strong, about four-fifths as long as arista. Post-vertical bristles about equal in size to the black bristle at lower portion of propleura. Antennae black, third segment approximately as long as wide, rounded at apex, densely gray pubescent. Arista brown, about two and one-half times longer than remainder of antenna. The mouthparts are brown; the labella, measured beyond the eye margin, are about one-fifth to one-sixth as long as the eye height (in *binodata* they are about one-third as long as the eye). **Thorax:** Metallic green on the sides of the mesonotum, purple through the median portion, pleura gray, metallic green in ground color. **Legs:** Predominantly subshining green, almost black, tarsi black, coxae dusted with gray. Front legs: Coxa about two-thirds as long as femur with numerous rather thin black bristles scattered along the dorsal surface. Femur with a row of seven or eight moderately strong anteroventral bristles. Tibia with two dorsal bristles, one near basal third, one near apical third, and two or three anterodorsal

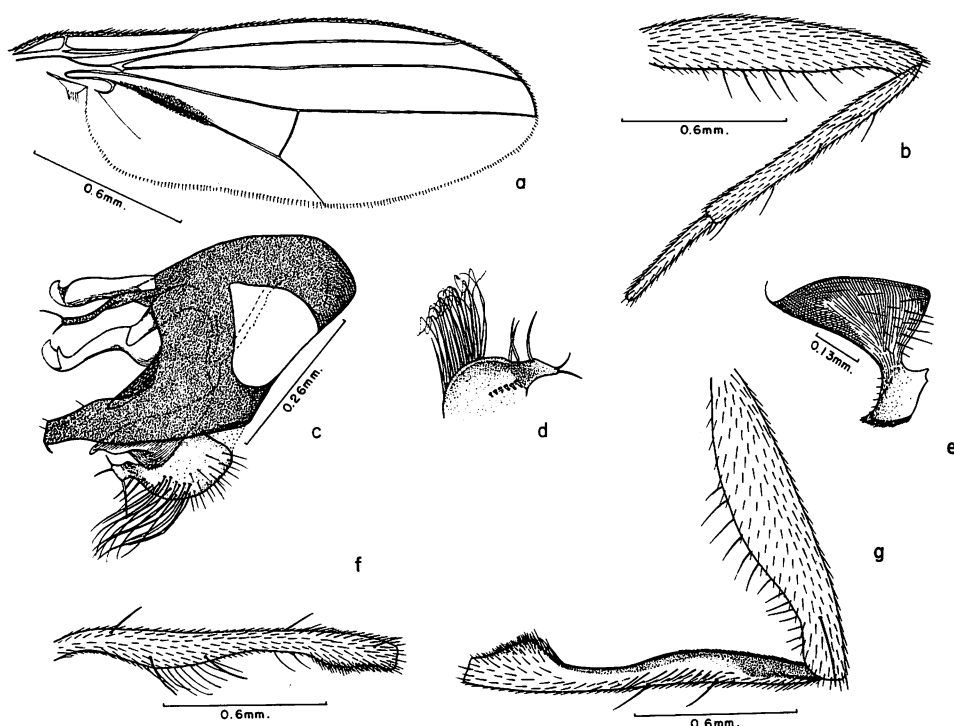


Figure 43—*Eurynogaster bullata* n. sp.: a, wing; b, front leg; c, male genitalia, lateral; d, cercus of male, inside view; e, ventral projection from fourth abdominal sternum of male; f, middle tibia, posterior view; g, middle femur and tibia, anterior view.

bristles before the middle (fig. 43b). Middle legs: Femur slightly swollen, with a row of bristles along the anterodorsal surface and a dense clump of fine setae near apical third on posteroventral surface. Tibia sinuate rather strongly thickened just before the apex, three posterodorsal bristles, one at basal fifth, one at apical third, and one preapical (fig. 43f). Two anterodorsal bristles, one at basal third, one at middle (fig. 43g). Also a row of rather strong hair-like anterior bristles; these are longest at the middle portion of the segment. Hind legs: Femur with two anterior bristles near apical fifth, also a row of rather strong anteroventral bristles at apical third. Tibia with two posterodorsal bristles near basal one-fourth and four anterodorsals rather evenly spaced on the basal one-fifth through the apical one-third, also with three apical bristles. Knobs of halteres brown to black. *Wings*: Faintly brownish fumose, squamae with long black hairs on the margin. Fourth costal section just slightly wider than fifth at apex. An elongate black bulla extends over the basal half of the first section of vein M_{3+4} . The last section of M_{3+4} is slightly longer than the m crossvein (fig. 43a). *Abdomen*: Green to blue-green, rather faintly brownish gray dusted; thickly covered with black setae and bristles. Fourth sternum with a capitate projection in middle of

hind margin. This is densely pilose at apex (fig. 43e). Genitalia as in figure 43c-d.

Length: body, 3.0 mm.; wings, 3.2 mm.

FEMALE. Like the male except for differences in the leg and genital characters; also lacks the bulla on the wing. Face equal in width to about twelve to fourteen eye facets. Front legs similar to those of the male. Middle legs: Femur almost devoid of bristles, with only a moderately strong preapical anterior bristle and a weak preapical posteroventral. Tibia, four apical bristles, two posterodorsal bristles, one near basal fifth, one near apical third; three anterodorsals, one near basal fifth, one near basal fourth, one near middle. Hind legs similar to those of the male except that the ventral bristles are not well developed.

Length: body, 3.6 mm.; wings, 4.0 mm.

Holotype male: Kaiholena, Kohala Mts., 4,000 ft., Hawaii, August, 1952 (D. E. Hardy). Allotype female; same data as type. One paratype female: same locality and date (W. C. Mitchell).

Type and allotype in the B. P. Bishop Museum. Paratype in the University of Hawaii collection.

Eurynogaster callaina Hardy and Kohn, new species (fig. 44a-b).

Apparently related to *E. variabilis* n. sp. but differing by having the anterior bristle of middle tibia situated at basal two-fifths of segment; by having the anteroventral bristles of tibia located on basal third of segment; by the narrow face, and by differences in the male genitalia (fig. 44b). It is somewhat like *angustifacies* because of its narrow face, but the leg bristles are very different in the two species.

MALE. A submetallic blue-green species. **Head:** Face narrowed to about three rows of eye facets on the lower portion, rather densely gray pubescent. Front and vertex gray, the latter faintly shining. Antenna black, third segment about as wide as long, rounded at apex. Arista subapical, short pubescent, about two times longer than remainder of antenna. **Thorax:** Metallic blue-green predominantly, dusted with gray pollen, the central portion of the mesonotum brownish gray; there is a slight indication of two gray, submedian, vittae down the mesonotum, set off by a slightly more shining area down the median portion and down each side just outside the dorsocentral row. Halteres yellow, faintly tinged with brown. **Legs:** Predominantly brown or yellow-brown. Coxae dark brown to black in ground color, densely gray. Femora chiefly brown, somewhat blackened on dorsal surface and with a distinct metallic green sheen. Tibiae yellow-brown, tarsi largely brown. Front and hind legs without ventral bristles or long hairs. Each middle femur with four rather strong bristles situated at basal third, plus about eight short bristles which extend to apical third; the bristle fourth from base is the strongest (fig. 44a). Anterior bristle of middle tibia situated at basal two-fifths of segment and with four or five moderately developed anteroventral bristles at basal

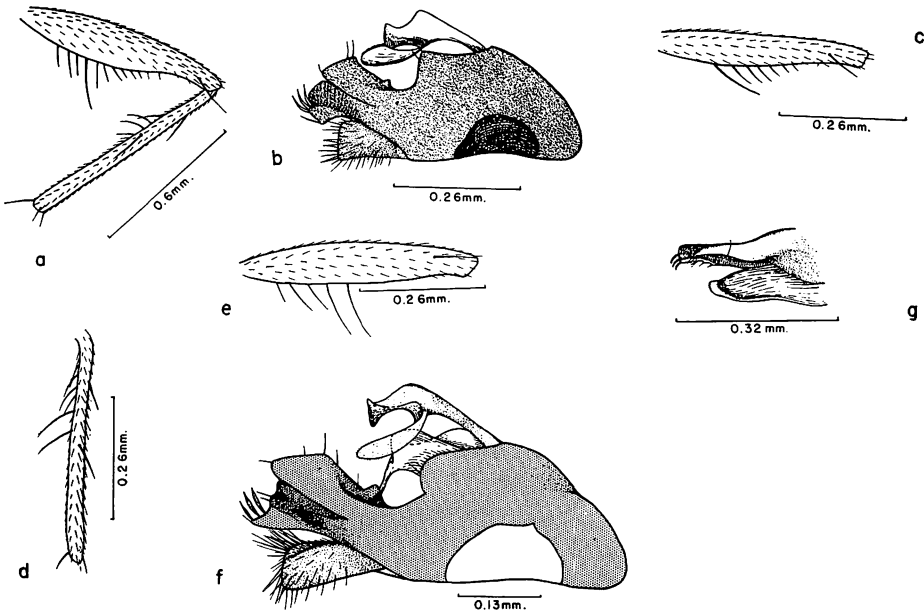


Figure 44—*Eurynogaster callaina* n. sp.: a, middle femur and tibia; b, male genitalia, lateral. *E. cilifemorata* Parent: c, middle femur; d, middle tibia; e, hind femur; f, male genitalia, lateral; g, clasper and lobes of ninth sternum of male, dorsal view.

third. *Wings*: Faintly fumose. Veins R_{4+5} and M_{1+2} almost parallel. Fourth costal section one-half to two-thirds longer than fifth. Last section of vein M_{3+4} about three-fourths as long as m crossvein. *Abdomen*: Metallic blue-green, rather densely gray to brownish gray pollinose. Genitalia as in figure 44b.

Length: body, 2.0 mm.; wings, 2.3 mm.

FEMALE. Lacking the ornamentation on the middle legs; the face distinctly broader, about equal in width to five or six rows of eye facets; otherwise similar to the male.

Length: body, 2.2 mm.; wings, 2.8 mm.

Holotype male, allotype female, and one paratype male: Honomanu, Maui, June, 1920 (E. H. Bryan, Jr.).

Type and allotype in the B. P. Bishop Museum. Paratype in the University of Hawaii collection.

***Eurynogaster cilifemorata* Parent (fig. 44c-g).**

Eurynogaster cilifemorata Parent, 1939, Proc. Haw. Ent. Soc. 10:241, figs. 24-25.

Endemic. Oahu (type locality: Mt. Olympus Trail, 2,400 ft.). Known only from the Koolau Mountains.

Type in Parent's collection at the Museum National d'Histoire Naturelle, Paris. The type is the male specimen from Mt. Olympus; it has not been designated.

This fits in the group of species which lacks bristles or spines on the front femora and which has no processes on the lateral margins of the fourth tergum of the male; also which has at least the hind femora predominantly brown. It differs from most species in this group by the presence of long cilia on the hind femora (fig. 44e). It is closest to *retrociliata* Parent, differing by having brown halteres; midfemur of male lacking a small preapical bump on ventral surface; middle tibia straight or nearly so, and apical bristles of hind tibia procumbent, not erect and at right angles to tibia.

A moderately small, submetallic, rather densely gray or brown pollinose species. The third antennal segment is slightly longer than wide. Face silvery gray; front gray on the sides, brown around the ocellar tubercle. Mesonotum largely brownish gray with a faint green metallic sheen. The hind femora are predominantly brown with just the narrow apices of bases yellow. The front femora are brown on the dorsal portion, the middle femora (fig. 44c) are entirely yellow except for a slight discoloration of brown above in some specimens. Each middle tibia has a row of six posteroventral bristles in the median portion; these are graduated in size from one strong bristle situated near basal third, to a rather tiny bristle at apical third (fig. 44d). Each middle tibia has a row of six or seven anteroventral bristles extending over the basal two-fifths of the segment; those near the base are recumbent, those more distad are erect. Each hind femur with a row of long hair-like anteroventral bristles near middle portion (fig. 44e). Wings faintly brownish or gray fumose. The fourth costal section is nearly two times longer than fifth, at the apex the width of cell R is almost equal to the length of the m crossvein. Crossvein m slightly longer than the last section of M_{3+4} . Knobs of halteres brown. Male genitalia as in figure 44f-g.

Length: body, 1.75-2.00 mm.; wings, 2.20 mm.

Eurynogaster clavastyla Hardy and Kohn, new species (fig. 45a-d).

Fitting close to *E. parenti* n. name but lacking the long bristles on front femur and also differing by having fine ventral bristles on entire length of hind femur and each cercus enlarged at apex with a long narrow stem and developed as in figure 45b.

MALE. *Head*: Face, palpi, and upper portions of labella densely silvery white pubescent; at its narrowest point the face is about equal in width to five rows of eye facets. Vertex and front submetallic green, rather thickly gray-brown pollinose. Antennae black (third segment broken). *Thorax*: Brightly metallic green, especially in the median portion of the mesonotum; mesonotum rather densely gray around the sides, more thinly brown pollinose over the median portion. Halteres yellow. *Legs*: Coxae and femora predominantly dark brown to black,

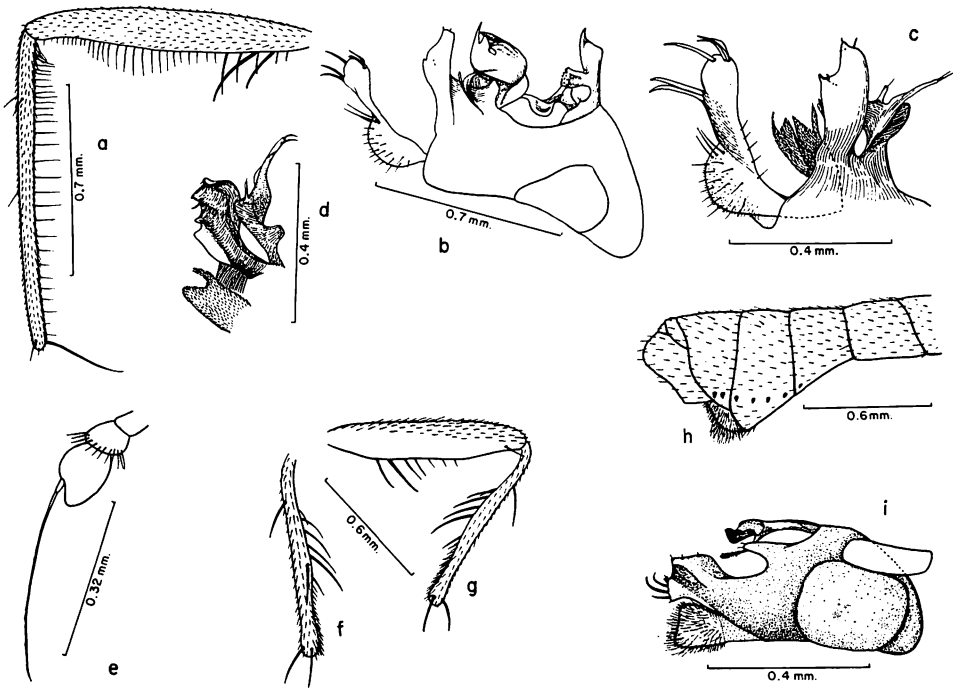


Figure 45—*Eurynogaster clavastyla* n. sp.: a, middle femur and tibia, anterior view; b, male genitalia, lateral; c, male genitalia, lateroventral view; d, lobes of the ninth sternum, dorsal view, looking in genital chamber (clasper shown at base). *E. clavicauda* Van Duzee: e, antenna; f, middle tibia, anterior view; g, middle femur and tibia, posterior view; h, male abdomen, lateral; i, male genitalia, lateral.

gray pollinose; tibia all yellow, tarsi yellow, tinged lightly with brown. The hind femora are narrowly yellowish at their bases. Each front coxa with scattered pale erect hairs on dorsal surface, plus the row of large apical bristles. Ventral portion of each front femur with two rows of short black bristles on apical two-fifths and one row of about five thinner bristles extending from these to about basal two-fifths. Ventral surface of each front tibia with two rows of short, stubby, black setae extending the entire length. Ventral surface of middle femur with two long black, rather flattened bristles near basal one-fifth plus a row of slender rather elongate bristles extending the entire length of the segment. Ventral surface of middle tibia with two rows of long bristle-like hairs extending the full length of the segment; the apical spur is almost two-fifths as long as basitarsus (fig. 45a). Hind femur with a row of long hair-like anteroventral bristles extending the entire length, also with a strong posterodorsal bristle near apical one-fifth. *Wings*: Nearly hyaline, faintly infuscated, cell R_5 narrowed at apex. Fifth costal section slightly over half as long as fourth. Last section of M_{3+4} about half as long as m crossvein. *Abdomen*: Rather brightly green, dusted with gray-brown pollen. Genitalia as in figure 45b-d.

Length: body, 3.3 mm.; wings, 3.5 mm.

FEMALE. The female cannot be positively placed with the male; however, the specimen on hand appears to fit here. It is much like the male except for the usual sexual characters. The legs are not so dark colored; the front femora are brownish on the dorsal surface, the middle femora are slightly discolored above and the hind femora are brown on apical three-fifths, yellow at bases. The femora and tibiae lack bristles or conspicuous hairs. The leg bristles are similar to those of related species. Besides the four apical bristles each middle tibia has two strong anterodorsals, three posterodorsals, and one small dorsal bristle. The latter is situated near the apical third of the segment. Each hind tibia has three apical bristles, four anterodorsal, and three posterodorsal bristles.

Holotype male: Mohihi Ridge, Kauai, July 15, 1937 (E. C. Zimmerman). The female specimen mentioned above is from Alakai Swamp, Kauai, July 10, 1928 (E. H. Bryan, Jr.).

Both specimens have been returned to the B. P. Bishop Museum.

Eurynogaster clavaticauda Van Duzee (fig. 45e-i).

Eurynogaster clavaticauda Van Duzee, 1933, Proc. Haw. Ent. Soc. 8:340, figs. 68-70.

Endemic. Oahu (type locality: Mt. Kaala). Rather common in both the Wai-anae and Koolau Mountains, Oahu.

Type in the Hawaiian Sugar Planters' Association collection.

Similar in many respects to *E. hawaiiensis* (Grimshaw). Distinguished by the differences in chaetotaxy of middle legs; by the slightly sinuate middle tibiae; by the hind tibiae being more swollen at apex; and by the differences in the male genitalia (fig. 45i). It is also readily recognized by having the ventral bristles of middle femora arranged toward middle of segment, not extending beyond about apical third; by the very strong anteroventral bristles; and by the dense clump of black anteroventral setae near apex of each middle tibia (fig. 45f). The predominantly yellow legs will also help to differentiate it from related species.

Rather lightly pollinose species. Face and front dense gray to white; mesonotum brownish gray, abdomen brown pollinose; mesonotum and abdomen with a faint greenish sheen. Third antennal segment just slightly longer than wide (fig. 45e). Halteres yellow. Femora and tibiae usually all yellow, those of hind legs often discolored with brown at their apices. Hind and front femora sometimes brownish on the dorsal surfaces. Each middle femur with two long plus five or six small posteroventral bristles arranged from about the basal third to about apical third of segment (fig. 45g). The larger of the anteroventral bristles on each middle tibia (situated near basal two-fifths) are as large and strong as the median anterodorsal or the posterodorsal bristle (situated near basal fifth).

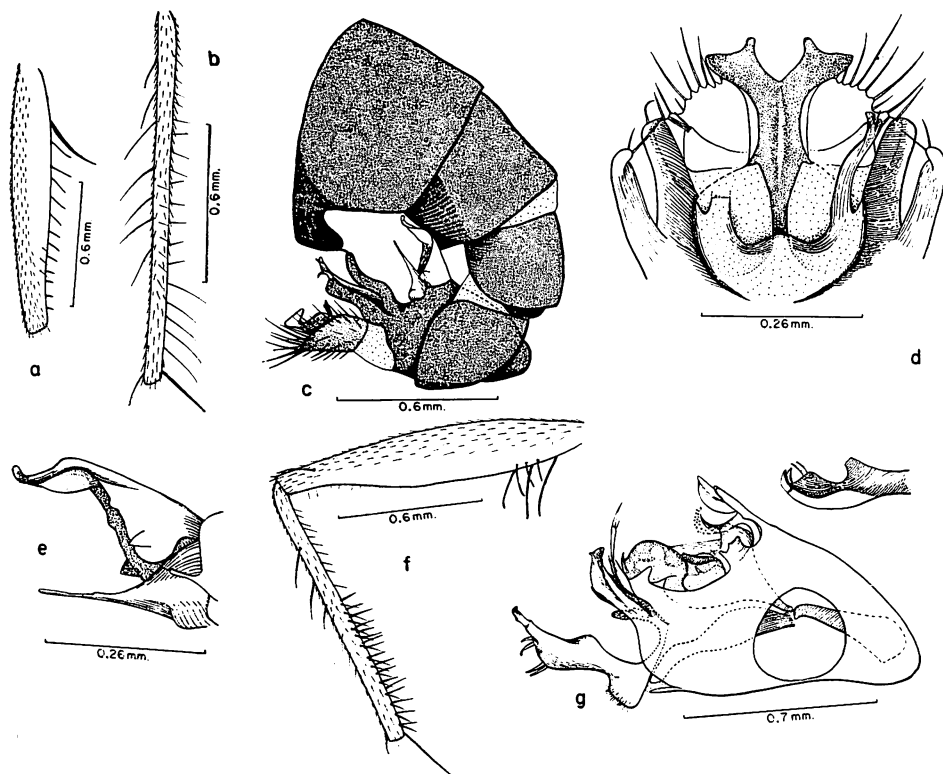


Figure 46—*Eurynogaster conspicua* n. sp.: a, middle femur, posterior view; b, middle tibia, anteroventral view; c, apex of abdomen and genitalia of male, lateral view (note: secondary lobe of ventral projection not visible in direct lateral view); d, apical half of genitalia, dorsal view; e, aedeagus, lateral view. *E. crassicercus* n. sp.: f, middle femur and tibia, anterior view; g, male genitalia; h, top inner view of left cercus of male.

Each hind tibia about two times wider at apex than at base. Abdomen shaped as in figure 45h. Genitalia as in figure 45i.

Length: body, 2.0–2.3 mm.; wings 2.5–2.7 mm.

***Eurynogaster conspicua* Hardy and Kohn, new species (fig. 46a–e).**

Fitting the group of species with the front femora lacking bristles or spines and the fourth tergum of male produced on lateral margins. Related to *E. gracilipennata* n. sp., but the posteroventral bristles of middle femora are strongest near base of segment and gradually become smaller toward apex; also a row of strong anterior bristles are present on middle tibia.

MALE. Head: Front gray pubescent, rather narrow, at its narrowest point it is about equal to the width of two rows of eye facets. Front brown, vertex slightly shining green. Antennae black, third segment as wide as long. **Thorax:** Lightly shining, green or coppery on the mesonotum, rather thickly covered with gray or

brownish gray pollen. Halteres yellow. *Legs*: Predominantly yellow; middle and hind coxae black, covered with gray pollen; hind femora brown at apices; hind tibiae and tarsi brown, tinged with yellow. Front coxae with scattered pale hairs over dorsal surface. Front and hind legs devoid of conspicuous hairs or bristles, except for the normal arrangement, although the hind femora have a row of moderately developed posteroventral hairs. On each middle femur the two basal bristles of the posteroventral row are very large, flattened, slightly curved, and about one-half longer than the width of the femur; the remainder of the bristles in this row diminish gradually in size to the apex (fig. 46a); also with a row of fine yellow-brown rather inconspicuous hairs along anteroventral surface. Each middle tibia with the anterior bristles extending from base to about apical two-fifths, the five or six most distad bristles are the strongest; a row of rather strong posteroventral bristles extending the entire length of the segment, the length of these is greater than the width of the segment; also with a row of rather inconspicuous short, anteroventral, setae extending over the median portion of the segment. The apical ventral bristle of middle tibia rather strong (fig. 46b), extending almost one-third the length of the basitarsus. *Wings*: Distinctly pale brown fumose. Fourth costal section two times longer than fifth. Last section of M_{3+4} about three-fifths as long as m crossvein. *Abdomen*: Green to coppery, dusted with gray or gray-brown pollen. The lateral projections from the anterior margins of the fourth tergum are very well developed, forming an enlarged, slightly bilobed, projection which curves posteriorly at almost a right angle. Genitalia as in figure 46c-e.

Length: body, 3.4 mm.; wings, 3.7 mm.

FEMALE. Unknown.

Holotype male: Mt. Kaala, Oahu, April 3, 1953 (C. P. Hoyt).

Type in the B. P. Bishop Museum.

***Eurynogaster crassicercus* Hardy and Kohn, new species (fig. 46f-h).**

Fitting in the complex of species which has the male abdomen greatly enlarged at apex, the cerci exposed and very ornate, and the middle tibia with a strong apical spine. It fits near *E. palustricola* n. sp. by having the legs entirely dark colored and with more than three long ventral bristles near bases of middle femora. It is best distinguished from *palustricola* by the development of the male genitalia; the cerci and other structures of the genitalia are very different in development as shown in figures 46g and 54h.

MALE. Entirely dark-colored species, rather brightly metallic in direct light. *Head*: Face gray, faintly metallic in ground color, about as wide as three to four rows of eye facets, at the narrowest point. Front brown, vertex submetallic blue-green. Third antennal segment as wide as long, arista scarcely two times longer than remainder of antenna. The extreme apical portion pale. *Thorax*: Brown to gray-brown pollinose on sides of mesonotum, rather brightly polished on the

median portion. Halteres yellow. *Legs*: Predominantly dark brown to black. Middle tibiae and basitarsi brown, tinged with yellow. Front coxa with only a few scattered pale hairs on dorsal surface. Each front femur with a row of moderately developed anteroventral bristles extending from near base to about apical third of segment. Each middle femur consisting of two strong ventral bristles and four moderately strong anteroventral bristles situated in a clump near base of segment (fig. 46f). Also a row of small anteroventral and a row of posteroventral bristles extend from near basal two-fifths to apex of segment. Each middle tibia with about three rows of moderately well-developed black bristles arranged along the ventral surface from about basal two-fifths to apex of segment. Hind legs without conspicuous bristles or long hairs, femur with a few small rather widely spaced bristle-like hairs along anteroventral surface. *Wings*: Hyaline or nearly so, cell R_5 rather strongly narrowed toward the apex. At the apex it is about half as long as in the median portion of the cell. Fourth costal section two times longer than fifth, crossvein m two times longer than last section of vein M_{3+4} . *Abdomen*: Metallic green or coppery, rather lightly covered with brown to gray-brown pollen. Apical portion greatly enlarged, two times wider than basal portion. Genitalia as in figure 46g-h.

Length: body, 3.6 mm.; wings, 3.8 mm.

Holotype male: Nualolo Valley, Kauai, July, 1952, 3,400 ft., (D. E. Hardy).

One paratype male: Kokee, Kauai, July 14, 1937, "beating" (E. C. Zimmerman).

Type in the B. P. Bishop Museum. Paratype in the University of Hawaii collection.

Eurynogaster dolichostoma Hardy and Kohn, new species (fig. 47a-b).

Fitting in the group of species which has the pleura largely yellow, front femora lacking bristles or spines, and the fourth segment of male not produced on the venter or on sides of tergum. It fits closest to *flaviventer* n. sp. but is readily differentiated by the very elongate mouthparts, by the difference in the bristling of the middle femora, and by the dense brush-like pubescence covering the entire ventral portion of the middle tibia (fig. 47a).

MALE. *Head*: Face gray pubescent; at its narrowest point it is about equal to the width of four rows of eye facets. Front and vertex gray, faintly shining. Antennae dark brown, third segment just slightly longer than wide, arista distinctly pubescent, three and one-half times longer than remainder of antenna. The labella are brown to black around the margins and otherwise reddish brown; they are very strongly developed, measuring slightly over two-thirds the length of the eye. *Thorax*: Subshining black above, with a greenish sheen in the ground color, rather densely covered with gray-brown pollen. Humeri dark brown to black except for the yellow lower margin. Pleura chiefly yellow, brown on upper portions of propleura, mesopleura, pteropleura, and metapleura; these darkened areas have a faint metallic green sheen. Metanotum chiefly yellow-brown, discolored

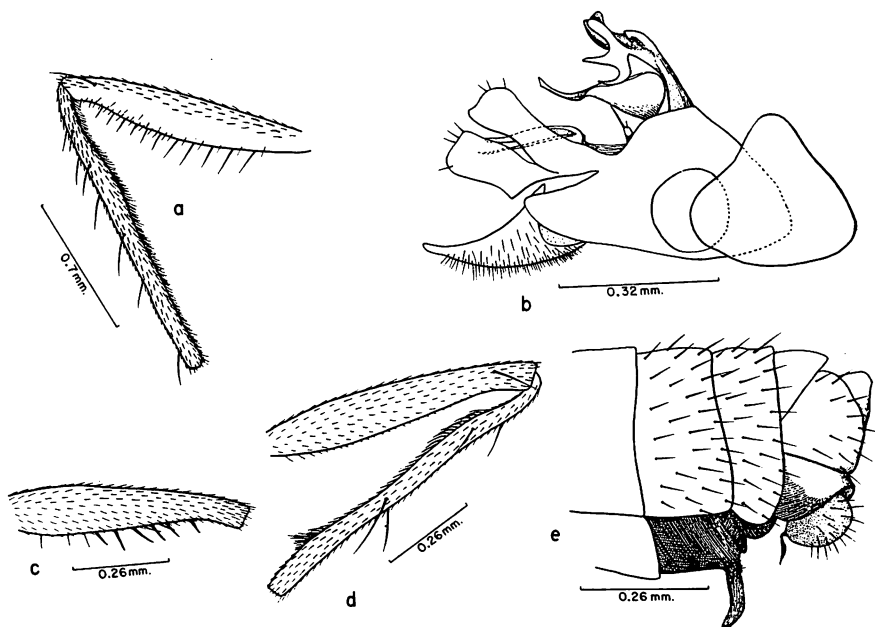


Figure 47—*Eurynogaster dolichostoma* n. sp.: a, middle femur and tibia of male; b, male genitalia. *E. exartema* n. sp.: c, front femur of male; d, middle femur and tibia of male; e, male genitalia.

with black on sides and in median portion. Halteres yellow. *Legs*: Predominantly yellow, coxae and femora entirely yellow, tibiae yellow in ground color but densely covered with short black hairs so that they appear darker than they really are. Tarsi densely covered with short black hairs. The basal segments appear to be yellow in ground color, the apical segments are brown. Front and hind legs without distinctive bristles or ciliation. Each middle femur with a row of about eleven posteroventral bristles; the basal four or five are heavier, also with numerous short black bristles or setae irregularly placed over the ventral and anteroventral surface at the apical third of the segment. Each middle tibia with a dense brush of fine brown hair over ventral surface (fig. 47a). *Wings*: Distinctly brown fumose, cell R_5 narrowed apically. Near the apex it is about two-thirds as wide as its broadest point and is about one-half as wide as the apex of cell R_3 . The last section of M_{3+4} is about two-thirds as long as the m crossvein. *Abdomen*: Sides and anterior margin of first tergum yellow. Abdomen otherwise dark brown to black, rather faintly shining, thickly dusted with gray-brown pollen. Genitalia as in figure 47b.

Length: body, 3.7 mm.; wings, 4.2 mm.

FEMALE. Similar to the male except for genital characters and leg bristling and, also, the pleura are entirely yellow. The humeri, sides of the mesonotum, and sides of terga two and three (and sometimes four) are also yellow. In some

female specimens the humeri are chiefly brown and the sides of terga two to four are entirely black as in the males.

Holotype male: Alakai Swamp, Kauai, 3,800 ft., July, 1952 (D. E. Hardy). Allotype female: Mt. Waialeale Trail, Kauai, 4,500 ft., August, 1953 (D. E. Hardy). Twenty-five paratypes (10 males and 15 females) from the following localities in the Kokee and Mt. Waialeale region of Kauai: same as type and same as allotype; Kainaumanu, 3,800 ft., July, 1952 (D. E. Hardy); Nualolo Val., 3,400 ft., July, 1952 (D. E. Hardy); Kalalau Lookout, 4,000 ft., August, 1953 (D. E. Hardy); and Kokee, 3,600 ft., July, 1952 (D. E. Hardy).

Type, allotype, and a series of paratypes in the B. P. Bishop Museum. Remainder of paratypes in the following collections: U. S. National Museum, British Museum (Natural History), Hawaiian Sugar Planters' Association, State Department of Agriculture, and University of Hawaii.

This species is taken by sweeping the ground litter and low growing vegetation in wet regions.

Eurynogaster exartema Hardy and Kohn, new species (fig. 47c-e).

Related to *E. hamata* n. sp., differing by the more elongate process on fourth sternum of male, by the differences in the chaetotaxy of the front legs (fig. 47c), and by the sinuate middle tibiae.

MALE. Predominantly green to blue-green species not quite so brightly metallic as *hamata*. *Head*: Antennae typical for the genus, with the third segment short, rounded at apex. Face blue, rather thinly gray pollinose on lower portion; at the narrowest point it is about equal to the width of eight rows of eye facets. Front blue-green to coppery. *Thorax*: Predominantly blue on the dorsum, slightly purplish down the median portion of the mesonotum. Entire mesonotum and scutellum lightly brown pollinose. Halteres brown. Pleura rather densely brownish gray pollinose, faintly metallic green. *Legs*: Yellow-brown to brown, sometimes the front femora and tibiae are almost entirely yellow with but a faint tinge of brown. Each front femur with four or five black anteroventral spines and two black posteroventral spines arranged near the median portion. Middle femora lacking well-developed ventral bristles. Middle tibiae rather sinuate, swollen at basal third and again near apex (fig. 47d). Anteroventral bristles moderately developed on hind femora, especially on the apical half. *Wings*: Faintly brown fumose, fourth costal section slightly wider than fifth. Last section of M_{3+4} approximately equal in length to the m crossvein. *Abdomen*: Rather short, compact, about equal in length to the thorax and metallic green. The projection from the posterior median margin of the fourth sternum is well developed, slender, somewhat curved upward, slightly hooked at the apex (fig. 47e); it is equal in length or just slightly longer than the fourth sternum. Genitalia as in figure 47e.

Length: body, 1.8–2.0 mm.; wings, 2.2 mm.

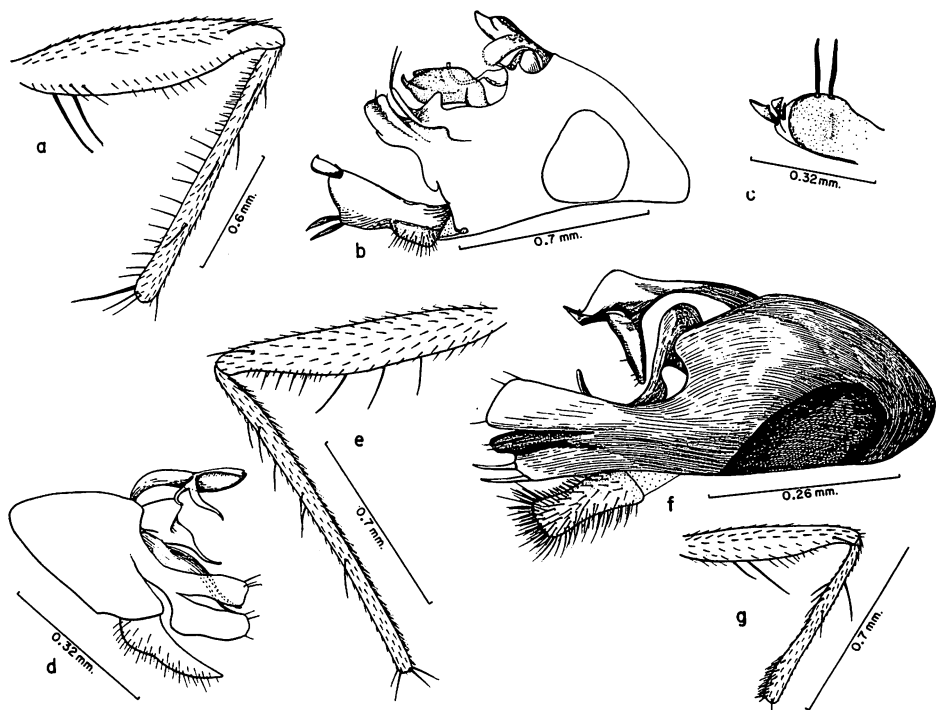


Figure 48—*Eurynogaster flavicrura* n. sp.: a, middle femur and tibia of male; b, male genitalia; c, inner view of cercus. *E. flaviventer* n. sp.: d, male genitalia; e, middle femur and tibia. *E. furva* n. sp.: f, male genitalia; g, middle femur and tibia.

Holotype male and one paratype male: Makamakaole Val., Maui, June, 1953 (D. E. Hardy).

Type in the B. P. Bishop Museum, paratype in the U. S. National Museum.

***Eurynogaster flavicrura* Hardy and Kohn, new species (fig. 48a–e).**

Fitting in the complex of species which has the apex of male abdomen greatly enlarged, the cerci exposed, and very ornate (fig. 48b, 48c), also the middle tibia of male with a large apical spine. It appears to fit closest to *E. parenti* n. name by the presence of posteroventral bristles on the front femora and by the male genitalia being of similar design. It is distinguished from *parenti* by its predominantly yellow legs; by having three or four smaller posteroventral bristles on front femora rather than two large bristles; by having conspicuous long setae on venter of middle femora and tibiae, extending the entire length of the segment; by the well-developed row of ventral bristles on hind femora, and by the male genital characters (fig. 48b).

MALE. Rather brightly metallic green or blue-green species. *Head:* Face and

front rather thickly gray pollinose, only the latter faintly metallic; vertex sub-metallic green. At the narrowest portion the face is about equal in width to five rows of eye facets. Antennae black, third segment slightly longer than wide. Arista very short pubescent, two and one-half times longer than remainder of antennae. *Thorax*: Mesonotum rather densely brownish gray, especially around the sides; the metallic coloration shines through brilliantly in the median portion. The secondary scutellar bristles are comparatively well developed; they are about one-fourth to one-fifth as long as the large bristles. Also, a third set of tiny bristles are sometimes developed between the two main bristles. Halteres bright yellow. *Legs*: Coxae dark brown to black, gray pollinose. Remainder of legs predominantly yellow, apices of hind femora brown, dorsal surfaces of front femora sometimes slightly discolored with brown. Tarsi brown, tinged with yellow, especially the hind pair. Front coxae with scattered pale hairs over the entire dorsal surface; anterior bristles of middle and hind coxae well developed. Each front femur with a row of three or four posteroventral bristles extending from near middle of segment to near basal fourth, the largest of these is about three-fourths the width of the femur; also, with two or more rows of short, thick bristles extending along the entire length of the anteroventral surface. Each front tibia with about two rows of closely placed short black setae (or bristles) along ventral surface. Each middle femur with four rather strong anteroventrals and two strong ventrals situated near basal third of segment; beyond this point with a row of fine anteroventral bristles and one or two irregular rows of short thick posteroventral bristles. Each middle tibia with a row of rather long, slender ventral bristles, the longest of these are nearly one-half longer than width of segment. Each hind femur with a moderately strong anteroventral bristle situated near base of segment and with a row of anteroventrals extending from about basal two-fifths to the apex. *Wings*: Faintly infuscated, subhyaline. Cell R_5 distinctly narrowed at apex; at the wing margin it is about half as wide as it is opposite the m crossvein. Fourth costal section about two times longer than fifth. Last section of M_{3+4} about one-half as long as m crossvein. *Abdomen*: Green, dusted with brownish gray pollen. Genitalia as in figure 48b and 48c.

Length: body, 4.0–4.2 mm.; wings, 4.5 mm.

FEMALE. Fitting the description of the male except for primary and secondary sexual characters. The leg bristling is the same as in other species of this complex and we see no way of differentiating the females except on leg coloration; this is not too satisfactory.

Holotype male and allotype female: S. Mohihi Ridge, Kauai, July 15, 1937 (E. C. Zimmerman). (On the type is the label "beating"; on the allotype is the label "*Metrosideros*.") Nine paratypes (two males, seven females): two same data as type; three, Alakai Swamp, Kauai, July 10, 1928 (E. H. Bryan, Jr.); one, Alakai Swamp, 3,800 ft., August, 1952 (D. E. Hardy); and three, Kokee, Kauai, 3,600 ft., July, 1952 (D. E. Hardy).

Type, allotype, and three paratypes are in the B. P. Bishop Museum. The

remainder of the paratypes are in the following collections: U. S. National Museum, Hawaiian Sugar Planters' Association, and University of Hawaii.

Eurynogaster flaviventer Hardy and Kohn, new species (fig. 48d-e).

Fitting in the groups of species which have the pleura predominantly yellow, which lack bristles on front femora or projections on the fourth abdominal segment. It fits nearest to *dolichostoma* n. sp. but differs by having short mouthparts, by the different bristling of the middle femora (fig. 48e), and by lacking the dense brush of fine hairs on the venter of the middle tibia.

MALE. *Head:* Face gray pubescent; at its narrowest point it is about equal in width to three rows of eye facets. Front and vertex gray, not metallic. Palpi brownish yellow with short black bristles above. Labella brown to black around the margins, yellow to rufous in the median portion; about one-third as long as the eye height. *Thorax:* Predominantly metallic green on dorsum, dusted with brownish gray. Halteres, humeri, sides of mesonotum, and scutellum yellow. Pleura predominantly yellow, upper mesopleura, pteropleura, and hypopleura submetallic green, dusted with gray. *Legs:* All yellow except for brownish apical segments of tarsi. Front and hind legs without bristles or conspicuous long hairs, except for normal arrangement; ventral hairs of hind femora not better developed than other femoral setae. Front trochanter with numerous short black setae scattered over upper surface. Each middle femur with four rather widely spaced, long, posteroventral bristles on basal two-thirds and four closely spaced, shorter, bristles on apical third; also with a clump of short black irregularly placed bristles on ventral and anteroventral surfaces at outer third (fig. 48e). Middle tibia lacking a dense brush of fine cilia on ventral surface. *Wings:* Hyaline or nearly so. Cell R_5 just slightly narrowed at wing apex. Fourth costal section two times longer than fifth. Last section of vein M_{3+4} equal to m crossvein. *Abdomen:* Yellow on sides and venter of first four segments, also on basal margin of first tergum; remainder dark brown to black, faintly greenish, brown to brownish gray pollinose. Genitalia as in figure 48d.

Length: body, 3.3 mm.; wings, 3.8 mm.

FEMALE. Similar to male except for the usual sexual characters.

Holotype male and allotype female: Upper Olaa Forest, Hawaii, July, 1953 (D. E. Hardy). Three paratypes (one male, and one female): same data as type, except August, 1952; and one female, N. Slope Hualalai, Hawaii, 4,000-6,000 ft., July, 1953 (D. E. Hardy).

Type and allotype in the B. P. Bishop Museum. Paratypes in the U. S. National Museum and the University of Hawaii collections.

Eurynogaster furva Hardy and Kohn, new species (fig. 48f-g).

Closely related to *E. kauaiensis* n. sp., differing by having the entire mesono-

tum gray pollinose and by the difference in the bristling of the middle femora as shown in figure 48g.

MALE. *Head:* Face entirely gray. Front and vertex brown. The latter slightly metallic. At its widest point the face is about equal in width to four rows of eye facets. Antennae black, third segment slightly longer than wide. Arista subapical, rather short, scarcely two-thirds longer than remainder of antenna. *Thorax:* Entirely gray pollinose with a faint metallic green sheen. Halteres yellow, tinged with brown on their knobs. *Legs:* Predominantly dark brown to black. Front and middle tibiae and basitarsi yellow in ground color. Front and hind legs without ventral bristles or long setae. The posteroventral surface of each middle femur has two strong, plus about six shorter, bristles arranged from the basal third to about the apical third of the segment. Each middle tibia with three strong anteroventral bristles situated near the basal third and with one anterior bristle near middle of segment (fig. 48g). *Wings:* Faintly fumose. Cell R_5 slightly narrowed apically. The fourth costal section about two times wider than fifth. Last section of M_{3+4} equal in length to the m crossvein; m crossvein slightly convex. *Abdomen:* Gray-brown pollinose, faintly metallic. Genitalia as in figure 48f.

Length: body, 2.1 mm.; wings, 2.3 mm.

FEMALE. Lacking the bristling of middle legs; the face about equal in width to eight rows of eye facets.

Holotype male and allotype female: Puu Alii, Molokai, 4,200 ft., July, 1953 (D. E. Hardy). Thirty-three paratypes, sexes about evenly divided, from the following localities: same data as type; Puu Kolekole, Molokai, 3,600 ft., July, 1953 (D. E. Hardy and M. Tamashiro); Puu O Kaeha, Molokai, 3,700 ft., July, 1953 (D. E. Hardy); Waikolu Valley, Molokai, 1,400 meters, April, 1955 (C. R. Joyce); and Waikamoi, Maui, June 25, 1920 (E. H. Bryan, Jr.).

Type, allotype, and a series of paratypes in the B. P. Bishop Museum. Remainder of paratypes distributed among the following collections: U. S. National Museum, British Museum (Natural History), Hawaiian Sugar Planters' Association, State Department of Agriculture, and the University of Hawaii.

***Eurynogaster fusticercus* Hardy and Kohn, new species (fig. 49a-c).**

Fitting in the complex of species which has the male abdomen greatly enlarged at apex, the cerci exposed and very ornate (fig. 49b, 49c); also, the middle tibia of male with a strong apical spine. It differs from others of the dark-legged species in this complex by the elongate cerci, which is nearly as long as the ninth segment and extends as far as middle of third abdominal segment; also, by the dark brown halteres, and by having only three strong ventral bristles near base of middle femur, as well as other structural details as brought out in the description below and as shown in figure 49a-c.

MALE. Entirely dark-colored species, rather brightly metallic green or coppery

in direct light. This is the smallest species of this complex. *Head*: Face brownish gray pubescent; rather narrow, at its narrowest point scarcely wider than two rows of eye facets. Front brown, vertex submetallic green. Antennae black; third segment slightly longer than wide; arista short pubescent, about two times longer than remainder of antenna. *Thorax*: Mesonotum rather thickly brown pollinose, especially around the sides; the median portion and scutellum brightly metallic. Pleura gray with a faint green sheen; halteres dark brown to black. *Legs*: Entirely dark brown to black, coxae gray pollinose. Front coxae with the usual strong black bristles at apex, but with only a few scattered pale hairs on the dorsal surface. Front femora devoid of conspicuous hairs or bristles, with only a row of short inconspicuous anteroventral hairs, scarcely visible except in certain views. Each middle femur with three strong ventral bristles near base; the middle of these is the longest, its length is greater than the width of the femur; also, a row of short anteroventral bristles extending from the strong bristles to the apex of the segment; posteroventral bristles are developed only on about the apical third of the segment; these are long and slender (fig. 49a). Each middle tibia with a row of fine, closely placed posteroventral bristles extending the entire length of the segment, the longest of these equal in length to the width of the segment; also, with a row of stronger anteroventral bristles extending about the apical half of the segment. Hind legs without conspicuous bristles or hairs aside from the normal arrangement, each femur with a row of small anteroventrals. *Wings*: Hyaline, cell R_5 not as narrowed as in some of the species in this complex, at apex about two-thirds as wide as opposite the m crossvein. Fourth costal section two times longer than fifth. Last section of vein M_{3+4} about three fourths as long as the m crossvein. Crossvein m straight. *Abdomen*: Coppery green, dusted with brownish gray. Genitalia very distinctive because of the elongate cerci (fig. 49b).

Length: body, 3.0 mm.; wings, 3.3 mm.

FEMALE. Front, face, and vertex, metallic blue to purple. The face broad, about equal to the width of ten rows of eye facets. Wings distinctly brownish fumose. Cell R_5 not noticeably narrowed toward the apex, veins R_{4+5} and M_{1+2} nearly parallel. Femora predominantly yellow, apical portion and sometimes the dorsal portions of front and middle pair (especially towards the apices) brown. Tibiae yellow-brown. Halteres yellow, tinged rather lightly with brown. The bristling of the legs is very similar to that of other species of this group. The mesonotum is more blue or purple in the specimens at hand than in the male.

Length: body, 3.2 mm.; wings, 3.7 mm.

Holotype male and allotype female: Mt. Waialeale Trail, Kauai, 4,500 ft., August, 1953 (D. E. Hardy). Ten paratypes: three males, two females, same as type; three males, two females, Alakai Swamp, Kauai, 4,000 ft., August, 1953 (D. E. Hardy). These were taken sweeping the ground litter in extremely wet regions. Mt. Waialeale is reputed to be the wettest spot on earth with an average rainfall from 450–500 inches a year. The Alakai Swamp is a vast swamp area just below Waialeale.

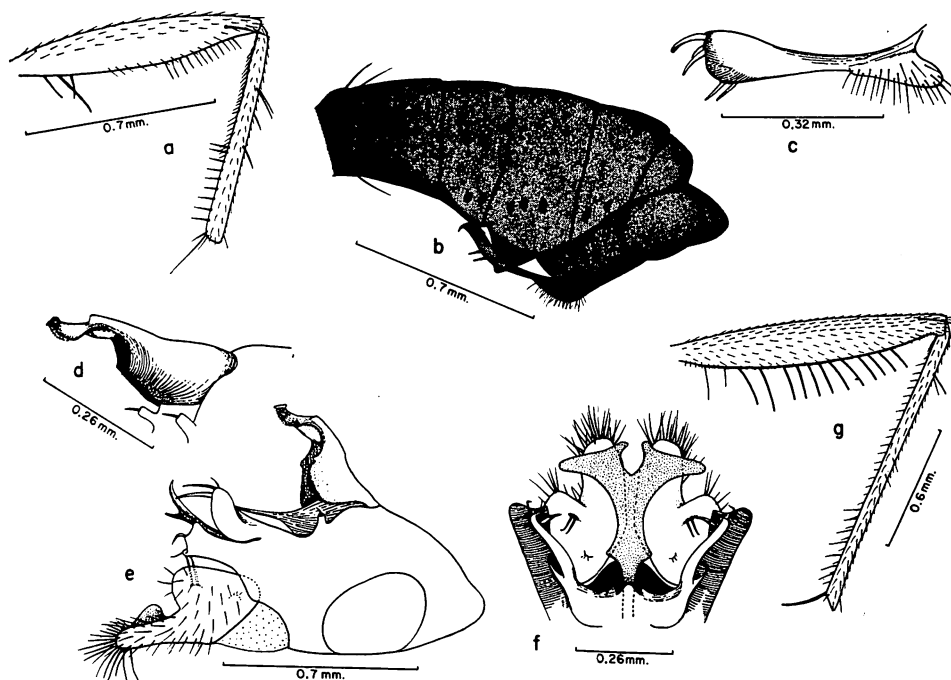


Figure 49—*Eurynogaster fusticercus* n. sp.: a, middle femur and tibia; b, male abdomen, lateral; c, cercus of male. *E. gracilipennata* n. sp.: d, ninth sternum of male; e, male genitalia; f, apical half of genital chamber of male, dorsal view; g, middle femur and tibia.

Type, allotype, and some of the paratypes deposited in the B. P. Bishop Museum. The remainder of the paratypes in the following collections: U. S. National Museum, Hawaiian Sugar Planters' Association, and the University of Hawaii.

***Eurynogaster gracilipennata* Hardy and Kohn, new species (fig. 49d–g).**

Fitting in the group of species with the front femora devoid of ventral bristles or spines and the fourth tergum of male produced on the sides. Related to *E. conspicua* n. sp. but differing by having 8–12 strong, blunt posteroventral bristles, in addition to the two large sub-basal bristles on each middle femur, and also by the middle tibiae lacking anterior bristles (fig. 49g). It differs from *E. aeruginosa* n. sp. by having just a simple row of ventral bristles on each middle femur and by lacking anterior ventral bristles on the hind femora.

MALE. Head: Face densely gray pubescent, very narrow, scarcely wider than one row of eye facets. Palpi rather thickly covered with pale bristles on upper surface. Front and vertex gray to brownish gray, metallic green or blue only in the area around the ocellar triangle. Antennae brown, third segment as wide

as long. Arista distinctly pubescent, three times longer than remainder of antenna. *Thorax*: Rather brightly metallic green or coppery on the dorsum, thickly dusted with brown on the upper portion of the mesonotum, gray around the sides and on the scutellum. Pleura gray, faintly metallic green. Halteres clear yellow. *Legs*: Predominantly yellow, mid and hind coxae yellow-brown in ground color, densely gray pollinose. Hind femora slightly discolored with brown on the upper apical portion. Hind tibiae faintly brownish at apex and hind tarsi brown with a yellow tinge. Front coxae with only a few scattered pale hairs on dorsal surface in addition to the apical bristles. Front and hind legs devoid of bristles or conspicuous hairs except for the normal arrangement. The antero-ventral surface of each middle femur with two strong, pointed, black bristles near basal one-fourth and with a row of eight to twelve thick, blunt bristles extending from near middle to apical one-sixth; these ventral bristles are approximately equal in length to the width of the segment. Ventral surface of each middle tibia with a row of erect, dark brown to black bristles extending the entire length. These are slightly greater in length than the width of the segment (fig. 49g). The apical ventral bristle is about one-third as long as the basitarsus. *Wings*: Hyaline. Fourth costal section two times longer than fifth. Last section of M_{3+4} about two-thirds as long as m crossvein. Basal portion of wing slender. Anal lobe greatly reduced. *Abdomen*: Metallic blue or green, dusted with gray-brown pollen. Projection of lateral margins of fourth tergum very well developed. Genitalia as in figure 49d-f.

Length: body, 3.3 mm.; wings, 3.7 mm.

FEMALE. Unknown.

Holotype male: Haleauau, Oahu, July 4, 1938, "ex *Gouldia*" (O. H. Swezey). One paratype male: Mt. Kaala, Oahu, April, 1953 (D. E. Hardy).

Type in Hawaiian Sugar Planters' Association collection. Paratype in University of Hawaii collection.

***Eurynogaster hamata* Hardy and Kohn, new species (fig. 50a-c).**

Related to *E. saxatilis* (Grimshaw) and *viridifacies* Parent from Oahu, but differing by having the front femora much more thickly spinose (fig. 50a); the halteres brown to black; and the legs chiefly black in ground color. Also close to *E. exartema* n. sp., differing by having a much shorter projection on fourth sternum of male; by the different chaetotaxy of the front legs, and by the straight middle tibia.

MALE. Rather brightly metallic blue, purple, or blue-green species. *Head*: Face blue to purple, rather brightly metallic, about equal in width to eight or ten rows of eye facets. Front blue-green, rather lightly dusted with brown pollen. Antennae black, third segment as wide as long. *Thorax*: Brightly metallic, blue to purple on the dorsum, rather thinly brown pollinose. *Legs*: Entirely black, except for yellow-brown trochanters, with a metallic green sheen to the coxae and

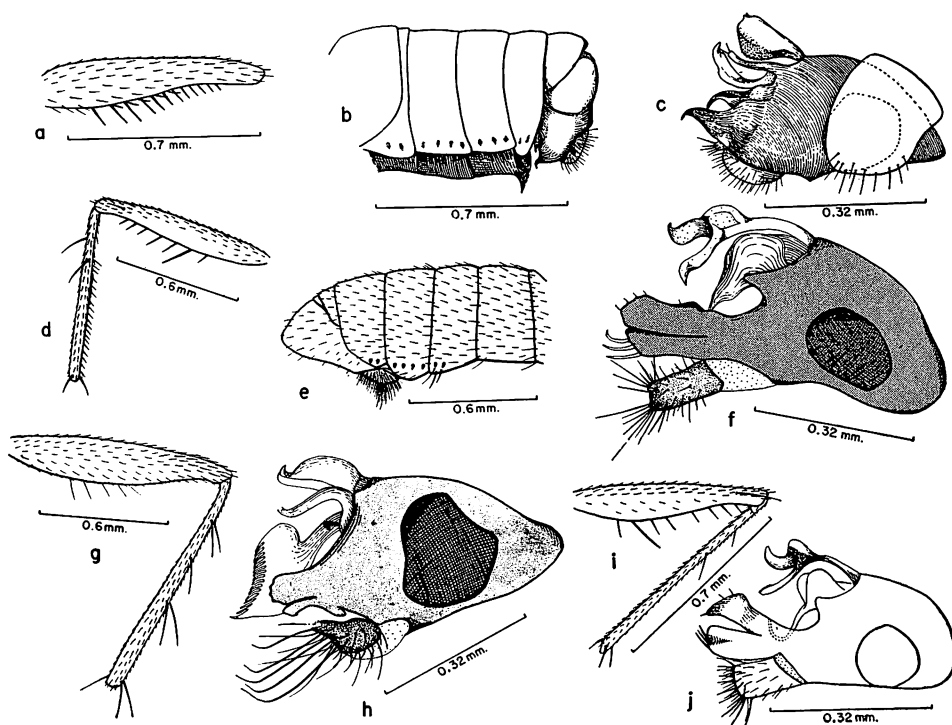


Figure 50—*Eurynogaster hamata* n. sp.: a, front femur; b, abdomen of male, lateral; c, male genitalia. *E. hawaiiensis* (Grimshaw): d, middle femur and tibia of male; e, abdomen of male, lateral; f, male genitalia. *E. hispida* n. sp.: g, middle femur and tibia; h, male genitalia. *E. incompta* n. sp.: i, middle femur and tibia; j, male genitalia.

femora. Front femora each with a row of about twelve rather strong, thick, black anteroventral bristles extending from approximately the basal fourth to the apical one-sixth of the segment; also with a row of five or six rather strong black posteroventral bristles plus several thin hair-like posteroventral bristles arranged toward the middle of the segment (fig. 50a). Each front tibia with two rows of short, stubby, ventral bristles extending the entire length of the segment. Apical fourth of middle femur with one long plus three or four tiny anteroventral bristles. One anterior bristle situated near apical one-fourth; a series of about ten ventral bristles arranged toward the middle of the segment, also with eight to ten fine posteroventral bristle-like hairs on apical half of segment. Middle tibiae straight or nearly so, without a distinct preapical swelling. Hind femur each with a row of 10 or 12 rather small, black anteroventral bristles arranged on apical two-thirds of segment. *Wings*: Faintly brownish fumose, fourth costal section just slightly wider than fifth. Last section of vein M_{3+4} approximately equal in length to the m crossvein. *Abdomen*: Metallic green to blue-green; genitalia subshining brown to black. Fourth sternum with a short pointed projection in middle of hind margin (fig. 50b). Genitalia as in figure 50c.

Length: body, 2.3 mm.; wings, 2.6 mm.

FEMALE. Fitting the description of the male except for sexual characters and except that the ventral bristles are lacking on the middle femora and there are fewer anteroventral bristles on hind femora.

Length: body, 2.8 mm.; wings, 3.0 mm.

Holotype male and allotype female: Puu Kolehole, Molokai, 3,600 ft., July, 1953 (D. E. Hardy). Nine paratypes (five males, four females): same data as type (D. E. Hardy and M. Tamashiro); and from Waikolu Valley, Molokai, 1,400 meters, May, 1955 (C. R. Joyce).

Holotype and allotype in B. P. Bishop Museum. Paratypes distributed among the following collections: U. S. National Museum, British Museum (Natural History), Hawaiian Sugar Planters' Association, and University of Hawaii.

Eurynogaster hawaiiensis (Grimshaw), new combination (fig. 50d-f).

Chrysotus hawaiiensis Grimshaw, 1901, Fauna Hawaiiensis 3 (1):16.

Eurynogaster nitida Van Duzee, 1933, Proc. Haw. Ent. Soc. 8:341, figs. 71-72.

New synonymy based upon a study of the type of *nitida* in Hawaiian Sugar Planters' Association collection and comparison with a large series of specimens from numerous locations on the island of Hawaii.

Endemic. Hawaii (type locality: Olaa). Common in the rain forests (tree-fern jungle) around the slopes of Mauna Loa. Previously known only from the type male taken in 1895.

Type in British Museum (Natural History).

The type male of *nitida* (Kaumana, Hawaii) is somewhat aberrant in that the anteroventral bristles of middle tibiae are weak and rather hair-like. It compares favorably, however, with variants found in a large series of specimens; considerable variation has been seen in the development of the ventral bristles of both the middle femora and the tibiae in this species.

Related to *E. clavaticauda* Van Duzee and differentiated by the chaetotaxy of the middle legs and by the genital characters. Each middle femur usually has 2 large plus 8 to 12 smaller bristles which extend nearly to the apex of the segment; the middle tibiae are straight and the anteroventral bristles are smaller than the antero- or posterodorsals, scarcely longer than width of segment; also, no clump of ventral setae is present before apex of middle tibia.

Colored much as in *clavaticauda*, but more submetallic green or blue-green on the mesonotum and abdomen, not quite so thickly pollinose. Halteres clear yellow. Legs predominantly yellow. Apex of hind tibia brown, dorsal portion of hind femur and front femur often brown to black, especially on the apical halves. Arrangement of bristles on middle legs as in figure 50d. Hind tibiae not quite so swollen at apices as in *clavaticauda*. Male genitalia as in figure 50e-f.

Length: body, 2.4-2.7 mm.; wings, 3.0-3.2 mm.

Eurynogaster hispida Hardy and Kohn, new species (fig. 50g-h).

An entirely black-legged species fitting in the group which lacks ventral bristles or long ciliation on front and hind femora or projections from the fourth abdominal segment of the male. It is distinguished from other known *Eurynogaster* by the very strong bristles on the body and by the lack of distinct ventral bristles on middle femora. In this regard it is closely related to *williamsi* n. sp. but is distinguished by the all-black legs, by lacking an anteroventral bristle or erect ventral setae on middle tibiae, and by having fewer anteroventral hairs on middle femora (fig. 50g).

MALE. A rather compact-bodied, very thickly haired species. *Head:* Face metallic purple rather lightly black pubescent; at its narrowest point it is about equal in width to seven rows of eye facets. Front and vertex metallic blue to purple, brownish gray pubescent. Palpi dark brown to black. Mouthparts brown, tinged with yellow. Antennae dark brown to black; third segment about one-half longer than wide, rather narrowed, subacute at apex. Arista dorsal, situated near the base of the segment, rather long pubescent, and over four times longer than remainder of antenna. *Thorax:* Metallic black, faintly purple in ground color dusted with brown on the dorsum, gray on the sides; all of the bristles are unusually long and strong. The scutellar bristles extend beyond the apices of the second abdominal segment. Humeri yellow, tinged with brown. *Legs:* Dark brown to black, faintly tinged with yellow on apices of front and middle femora and on front and middle tibiae, very densely black-haired. Each middle femur with about five anteroventral hairs in a row near middle of segment. Other femora without long cilia or unusual bristles. Each middle tibia has four anterodorsals and three posterodorsals, including those at the apex. Each hind tibia with four anterodorsals and two posterodorsals, not counting the apical bristles. *Wings:* Light brown fumose. Cell R_5 not narrowed apically. Veins R_{4+5} and M_{1+2} parallel. Fourth costal section about one-third longer than fifth. Last section of M_{3+4} about three-fourths as long as the m crossvein. *Abdomen:* Rather compact, scarcely longer than thorax, very thickly haired and with a row of long bristles around the apex of each segment, these equal or slightly longer than the segment; submetallic black in ground color, rather densely brown pollinose. Genitalia as in figure 50h.

Length: body, 2.7 mm.; wings, 3.2 mm.

FEMALE. Very closely fitting the description of the male. The middle femora without long hairs, and the face about equal in width to eight or nine rows of eye facets.

Length: body, 3.0 mm.; wings, 3.5 mm.

Holotype male, allotype female, and one paratype female: Upper Olaa Forest, Hawaii, August, 1952 (D. E. Hardy and W. C. Mitchell). Also one paratype female from each of the following localities: Kau, Hawaii, 4,000 ft. (no date or collector); ridge above Haelaau, Maui, 3,000–3,500 ft., December 19, 1928 (E. H. Bryan, Jr.). Collected sweeping the ground litter in dense tree fern jungle.

Type and allotype and one paratype in B. P. Bishop Museum. One paratype each in the University of Hawaii collection and in the U. S. National Museum.

Eurynogaster incompta Hardy and Kohn, new species (fig. 50i-j).

A small species fitting in the group which lacks spines or bristles on front femora or projections on fourth segment of male and which has the pleura all dark-colored and the legs yellow. It fits closest to *E. clavaticauda* Van Duzee, but the mid tibiae are straight, not sinuate, and without marked ciliation; also, the middle femora have eight or nine ventral bristles extending along the entire length of the segment (fig. 50i).

MALE. *Head:* Face densely gray pubescent, about equal in length to five rows of eye facets, mouthparts entirely dark brown to black. Front gray, vertex brownish gray. Antennae black, third segment slightly longer than wide. Arista apical, rather short, about one-half longer than remainder of antenna. *Thorax:* Metallic green in ground color, rather densely gray pollinose, with a brownish gray vitta extending down the middle of the mesonotum. Margins and under portion of scutellum yellow; also, the ground color of the thorax just below wing bases is predominantly yellow. Halteres bright yellow. *Legs:* Middle and hind femora dark brown to black, densely gray pollinose; legs otherwise yellow except for brown apical segments of tarsi. Front and hind legs without conspicuous bristles or long hairs. Each middle femur with eight or nine posteroventral bristles extending from apex almost to the base of the segment, the second from the base the largest (fig. 50i). *Wings:* Nearly hyaline. Veins R_{4+5} and M_{1+2} parallel. Fourth costal section about one-half longer than fifth. Last section of M_{3+4} equal to m crossvein. *Abdomen:* Gray-brown pollinose, with a distinct greenish sheen. Genitalia as in figure 50j.

Length: body, 1.8 mm.; wings, 2.2 mm.

FEMALE. Unknown.

Holotype male: Mt. Kaala, Oahu, March, 1952 (M. S. Adachi). One paratype male, Lanihuli, Oahu, May 3, 1946 (W. W. Wirth). Type in the B. P. Bishop Museum. Paratype in the U. S. National Museum.

Eurynogaster kauaiensis Hardy and Kohn, new species (fig. 51a-b).

Fitting in the group of entirely dark-colored species which lacks ornamentations on the front or hind legs and on the third abdominal segment of the male. It is close to *E. furva* n. sp. and is differentiated by having the hind portion of the mesonotum brownish pollinose, by the anteroventral bristles of the middle femora being arranged closer to the base of the segment (fig. 51a), and by the male genitalia (fig. 51b).

MALE. *Head:* Face, densely gray-white pubescent; at its narrowest point it is about equal to the width of four or five rows of eye facets. Front and vertex brownish pollinose. Antennae black, third segment slightly longer than wide,

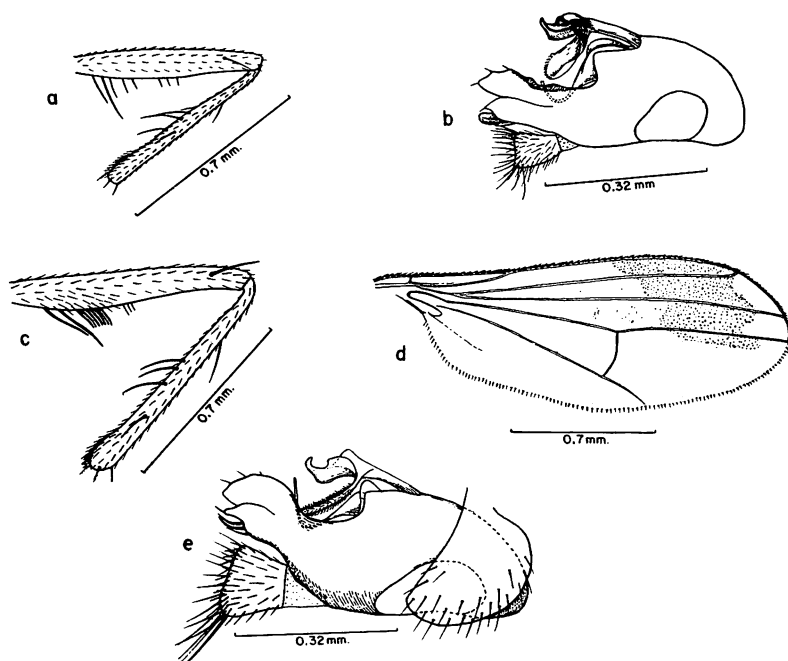


Figure 51—*Eurynogaster kauaiensis* n. sp.: a, middle femur and tibia; b, male genitalia. *E. maculata* Parent: c, middle femur and tibia; d, wing; e, male genitalia.

gently tapered to apex. Arista subapical, rather short, about two-thirds longer than remainder of antennae. **Thorax:** Front portion of mesonotum and all of pleura gray, hind half of mesonotum and all of scutellum gray-brown pollinose; very faintly metallic in ground color. Halteres yellow, tinged with brown at their apices. **Legs:** Entirely brown to black. Coxae and femora gray pollinose. Front and hind legs without ventral bristles or long hairs. Posteroventral surface of each middle femur with two long bristles situated near the basal one-fifth or one-sixth of the segment, followed by about four, evenly spaced, shorter bristles arranged just before the middle of the segment, followed by a space and three tiny bristles arranged just beyond the middle of the segment (fig. 51a). Anteroventral surface of middle tibia with three long, suberect bristles at middle of segment. Anterior bristles situated just before the middle. **Wings:** Almost hyaline, veins R_{4+5} and M_{1+2} nearly parallel, the former with a slight upward curve about opposite the apex of vein R_{2+3} . Fourth section of costa one-half longer than fifth. Last section of M_{3+4} about equal in length to the m crossvein; m crossvein straight. **Abdomen:** Rather densely gray to gray-brown pollinose with a faint metallic sheen.

Length: body, 2.0–2.2 mm.; wings, 2.3–2.5 mm.

FEMALE. Similar to the male in most respects. The pollen of the mesonotum,

however, is rather evenly brownish gray; also, the face is brown and is about equal in width to 10 or 12 rows of eye facets.

Holotype male and allotype female: Alakai Swamp, Kauai, 4,000 ft., August, 1953 (D. E. Hardy). Thirty-four paratypes (sexes about evenly distributed) from the following localities on Kauai: same as type; Nualolo Val., 3,400 ft., July, 1952 (D. E. Hardy); Kokee, 3,600 ft., July, 1952 (D. E. Hardy); Kainamanu, 3,800 ft., July, 1952 (D. E. Hardy); and Mt. Waialeale Trail, 4,500 ft., August, 1953 (D. E. Hardy).

Type, allotype, and a series of paratypes in the B. P. Bishop Museum. Remainder of paratypes distributed among the following collections: U. S. National Museum, British Museum (Natural History), Hawaiian Sugar Planters' Association, State Department of Agriculture, and the University of Hawaii.

***Eurynogaster maculata* Parent (fig. 51c-e).**

Eurynogaster maculata Parent, 1939, Proc. Haw. Ent. Soc. 10:242, figs. 29-30.

Endemic. Oahu (Mt. Kaala, 3,600 ft.), Molokai, and Hawaii. It lives on the ground litter in areas of heavy rainfall.

Differing from all other *Eurynogaster* by having the apices of the wings more darkly infuscated than the rest of the wing and by the chaetotaxy of the middle femora; especially characteristic is the very closely placed row of flat, blunt ventral bristles just before middle of femur.

A rather densely gray pollinose species only faintly metallic. Face entirely silvery gray pubescent. Front and vertex brown. Third antennal segment almost two times longer than wide; arista preapical. Thorax and abdomen gray, the terga brownish at apices. Halteres usually yellow-brown varying, however, from clear yellow to brown. Front and hind femora devoid of ventral bristles, middle femora as described above and as in figure 51c. Middle tibiae straight or nearly so, slightly enlarged at apices and each with a dense preapical brush of fine setae on the venter; also with a row of three strong, black, curved anteroventral bristles at middle, one anterior bristle at apical third and one posterodorsal bristle near basal fourth. Middle femur with a strong anterior bristle situated just before the apex. Wings slightly infuscated, more distinctly brown at apex. Last section of M_{3+4} about equal in length to m crossvein (fig. 51d). Male genitalia as in figure 52e.

Length: body, 2.50 mm.; wings, 2.83 mm.

***Eurynogaster minor* (Parent) (fig. 52a-d).**

Paraliancalus minor Parent, 1938, Konowia 16:213, figs. 31-34.

Endemic. Oahu (type locality: Kukuiala Valley, "Waianua Str." (probably Waianae Stream), and Kauai. Rather common on Mt. Kaala, Oahu, and in the Kokee region of Kauai.

Type apparently in the British Museum (Natural History). One specimen agrees in all respects with the data recorded by Parent. Also two specimens are

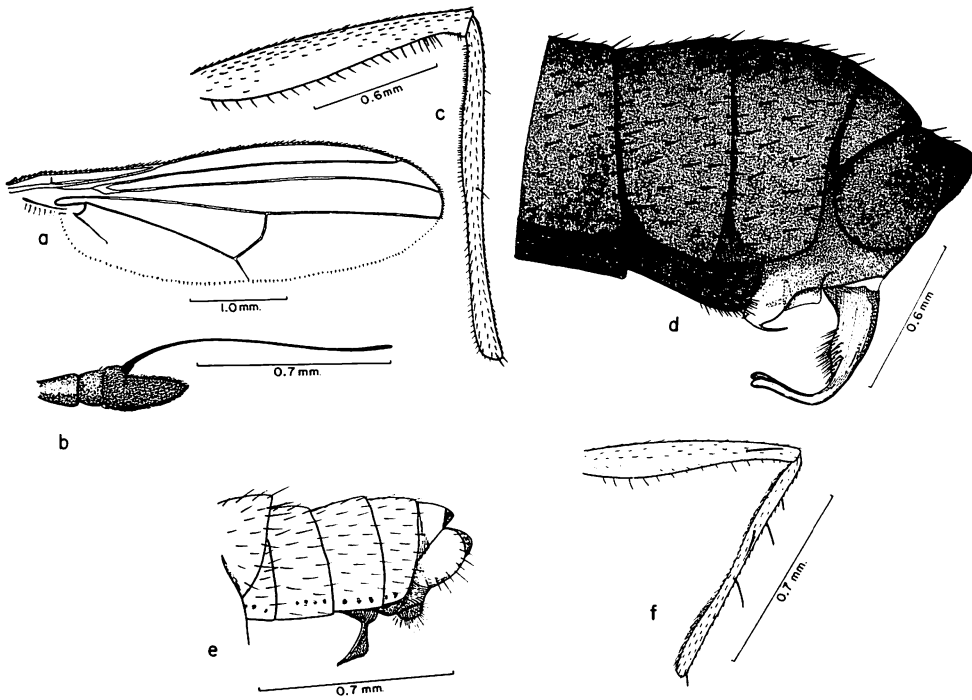


Figure 52—*Eurynogaster minor* (Parent): a, wing of female; b, antenna; c, front femur and tibia of male; d, male genitalia. *E. multispinosa* n. sp.: e, male genitalia; f, middle femur and tibia of male.

present in the collection from Mt. Kaala. Two specimens are in the Parent collection, Museum National d'Histoire Naturelle, Paris, from Mt. Kaala. These probably were included in Parent's type series although they were not mentioned in his description.

This species belongs in the group the males of which have the front femora bristled beneath. It is distinguished from related species by the elongate third antennal segment (one and a half to two times longer than wide) with the arista thickened at apex (fig. 52b); by the lack of a projection on the fourth sternum of abdomen; and by the differences in the vestiture of the legs as shown in figure 52c and as described below.

A large, dark-legged metallic green, blue-green, or coppery species. The antennae are as in figure 52b. Legs faintly metallic, in male front femora with fine, short ventral bristles (fig. 52c); front tarsi with dense fine ciliation on under portion; middle tibiae straight with short, fine setae below. Genitalia as in figure 52d. Wings as in figure 52a.

For information concerning the biology see Williams (1939:299–302). The immature stages develop in the moss at edges of mountain springs and seepage

areas, and the adults are found sitting on the wet banks and on vegetation near their breeding habitats.

Length: body and wings, 3.5–4.0 mm.

Eurynogaster multispinosa Hardy and Kohn, new species (fig. 52e–f).

Apparently related to *nigrohalterata* Parent, differing by having ventral bristles on middle and hind femora, and 10 short stout anteroventral and three to four posteroventral bristles on front femora.

MALE. *Head:* Front brilliant metallic green, at its narrowest portion it is about as wide as eight rows of eye facets. Front blue-green. Antennae black, third segment about as wide as long, rounded at apex; arista pubescent, about two and one-half times longer than remainder of antenna. *Thorax:* Mesonotum and scutellum bright metallic green, lightly brownish pollinose; halteres yellow. *Legs:* Dark brown to black, tinged with yellow on trochanters, tibiae, and basal tarsal segments. Anteroventral spines of front femur extending to about the basal third of the segment, the posteroventral bristles located near the middle of the segment. Hind tibiae devoid of bristles except for one tiny anterodorsal near basal third. Middle and hind femora each with a row of anteroventral bristles. Those of the hind legs are stronger, especially on the apical half of the segment; on the middle legs the bristles are best developed on the basal portion, becoming rather weak in the middle and stronger again toward the apex. Middle tibiae sinuate (fig. 52f), slightly enlarged before the apex, each with a row of curved anteroventral setae; two posterodorsal bristles, one near basal sixth and one near apical two-fifths of segment and two pairs of anterodorsal bristles, one near basal third and one near middle. Hind tibiae each with one dorsal bristle near basal third and with three anterodorsals, one near basal third, one near middle and one preapical. *Wings:* Faintly brownish fumose, fourth costal section slightly longer than fifth and last section of vein M_{3+4} about equal to the m crossvein. Squamae densely fringed with long brown hairs. *Abdomen:* Short and compact, about equal in length to the thorax; rather brightly metallic green, lightly covered with brown pollen. Fourth sternum with a rather elongate lanceolate projection from middle of hind margin. Genitalia as in figure 52e.

Length: body, 2.0 mm.; wings, 2.3 mm.

FEMALE. Unknown.

Holotype male: collected on dripping moss at spring near Wailau Pass, Molo-kai, 2,800 ft., December 19, 1937, (F. X. Williams).

Type returned to the B. P. Bishop Museum.

Eurynogaster nigripedis Hardy and Kohn, new species (fig. 53a).

Fitting in the group of species which lacks lobate processes on sides of fourth tergum, which lacks ventral bristles or spines on front femora, and which has the femora predominantly yellow. It is related to *E. apicenigra* Parent but is dif-

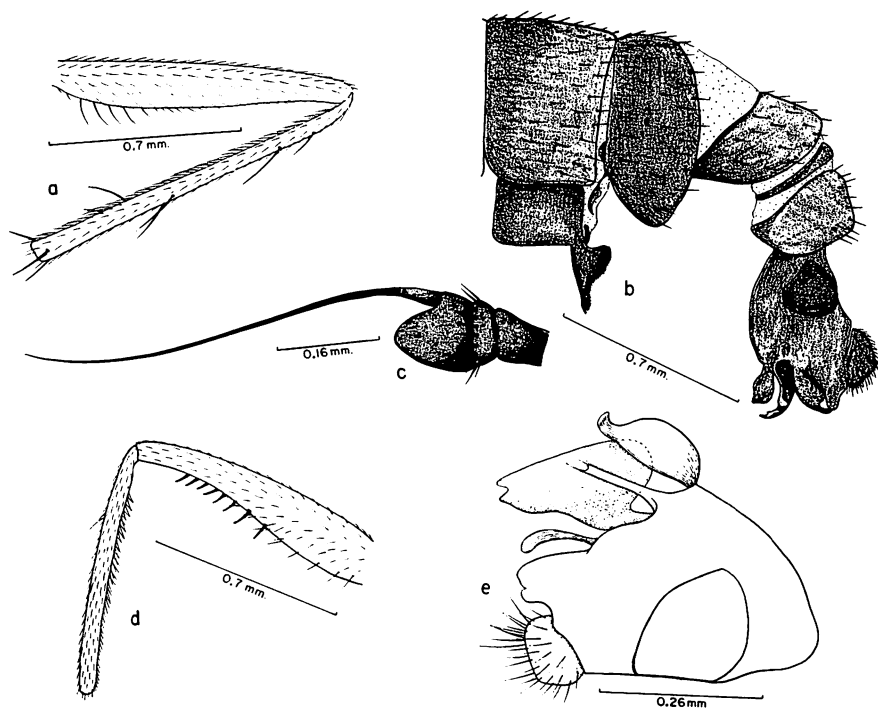


Figure 53—*Eurynogaster nigripedis* n. sp.: a, middle femur and tibia of male. *E. nigrohalterata* Parent: b, male genitalia; c, antenna; d, front femur and tibia. *E. nudata* n. sp.: e, male genitalia.

ferentiated by lacking long ciliation on the anteroventral surface of middle tibia, by having the hind tibia, all tarsi, and bristles on pronotum, all black, and by having five pairs of anterodorsal bristles on hind tibia.

MALE. Head: Eyes separated on the face for a distance equal to six or seven rows of eye facets. Face metallic blue to purple rather thinly covered with fine gray pubescence. Front, vertex, and occiput metallic green, covered with gray pollen. Basal two segments of antenna dark brown to black. Third segment brown at base, yellow apically and obtuse, about one-third longer than wide. **Thorax:** Blue-green to purple in ground color, rather densely gray pollinose on the sides, thinly gray on the dorsum. Five pairs of strong dorsocentrals present and no acrostichals. Halteres clear yellow. **Legs:** Front coxa, front and middle femur, and basal two-thirds of hind femur yellow; also front and middle tarsi yellow. Apex of hind femur, hind tibia, and all tarsi black. All femora slender and lacking strong ventral bristles; middle femur, however, with a row of small erect anteroventral bristles extending over basal half of segment, the longest of these less than the diameter of the femur. Basal two-thirds of front tibia with two anterodorsal and two dorsal bristles. Middle tibia with three anterodorsals and two dorsals. The hind tibia has five anterodorsals, counting the preapical and counting one small bristle developed near the base of the segment. Middle

tibia (fig. 53a) with a strong anteroventral bristle at apical third of segment and with short suberect hairs along anteroventral and ventral surfaces, the longest of these about equal to the diameter of the tibia. Front tarsus about one-third longer than tibia, and middle basitarsus about one-half as long as tibia. *Wings*: Light brown fumose. Fourth costal section two times longer than fifth. Vein M_{1+2} curved upward just beyond m crossvein. Last section of M_{3+4} slightly shorter than m crossvein. *Abdomen*: First tergum metallic blue, remainder of abdomen metallic green to black, covered with gray-brown pollen. The genitalia have not been relaxed for study.

Length: body, 3.35 mm.; wings, 3.60 mm.

FEMALE. Unknown.

Holotype male: Kula Pipeline, above Waikamoi, Maui, 4,200 ft., July, 1956 (R. Namba).

Type in the B. P. Bishop Museum.

Eurynogaster nigrohalterata Parent (fig. 53b-d).

Eurynogaster nigrohalterata Parent, 1939, Proc. Haw. Ent. Soc. 10:243, figs. 35-37.

Endemic. Oahu (type locality: Mt. Kaala). Known only from Mt. Kaala at elevations from 3,600-4,000 ft.

Type apparently in the Museum National d'Histoire Naturelle, Paris. One female was returned to the Hawaiian Sugar Planters' Association collection labeled "type," but it had been mislabeled "*nigrifacies*" by Parent; this should probably be the allotype. The remainder of the co-type series (six specimens) are in the Parent collection at the Museum National d'Histoire Naturelle, Paris. The type has not been designated, but it is obviously one of the males in this series.

Fitting in the group of species which has short stout ventral bristles on front femora and a rather long lanceolate projection on fourth sternum of male. It seems closest to *multispinosa* n. sp., from Molokai, but has only six to eight short anteroventral spines and no posteroventral spines on each front femur, and it lacks ventral bristles on middle and hind femora.

Medium-sized, rather brightly metallic species; face bright blue, coppery around the margins; front and median portion of mesonotum purple; sides of mesonotum and scutellum blue; pleura and abdomen green in ground color; legs brown, tinged with yellow; front femora as described above and as shown in figure 53d; middle and hind femora lacking ventral spines. Antennae short and blunt (fig. 53c). Middle tibiae slightly sinuate with two or more rows of short, closely placed setae along ventral portion; two posterodorsal bristles, one just beyond base and one near apical third; three anterodorsal bristles, one small one at basal one-fifth, one preapical, and one rather large bristle at middle of segment. Wings light brown fumose, last section of M_{3+4} just slightly shorter than m crossvein. Fourth sternum of male with a rather elongate lanceolate structure in middle of hind margin. Male genitalia as in figure 53b.

Length: 3.0 mm.

Eurynogaster nudata Hardy and Kohn, new species (fig. 53e).

A medium-sized, rather brightly metallic, dark-winged species readily differentiated by lacking ventral bristles or long cilia on the femora and by its long slender tarsi. Fitting closest to *E. apicenigra* Parent, but differing by having the midfemora and tibiae lacking the long ventral cilia.

MALE. *Head:* Metallic green-blue to purple across the vertex and upper portion of front, lower portion of front rather densely brown pollinose. Face submetallic, moderately gray pubescent. At its narrowest point the face is about equal in width to seven rows of eye facets. Antennae brown, tinged with rufous on the basal segments, third segment slightly longer than wide, rounded at apex. *Thorax:* Metallic green, blue, or purple on the mesonotum, moderately dusted with brown pollen. Pleura densely gray, faintly metallic green. Halteres clear yellow. *Legs:* Long and slender, predominantly yellow; apices of hind femora brown; middle and hind tibiae brown, tinged with yellow; middle and hind tarsi entirely brown. Front coxae elongate about two-thirds as long as femur, brown, tinged with yellow, other coxae brown. Each front coxa covered with rather numerous black setae or bristles on the dorsal surface; those near the base of the segment are longer, more erect, and those on the remainder of segment, except for the long apical bristles, are short, suberect. All femora devoid of bristles or conspicuous hairs except for the anterior bristle on each hind femur, situated near apical one-fourth of segment; the preapical antero- and posteroventral setae of each femur are slightly enlarged, somewhat bristle-like, but not at all conspicuous. Each front tibia with two small anterodorsals, one near basal fourth and one just before middle, and two small posterodorsals, one near basal third and one near apical two-fifths. Middle tibia straight and slender; besides the three apical bristles it possesses two posterodorsals, one near basal sixth and one near middle; also, three anterodorsals, one near basal seventh, one near basal third, and one near middle. Besides the three apical bristles each hind tibia has two posterodorsals, one near basal sixth and one near middle and three anterodorsals, one near basal sixth, one near basal two-fifths, and one near apical two-fifths. *Wings:* Distinctly light brown fumose. Fourth costal section about three-fourths longer than fifth, cell R_5 slightly narrowed apically. Last section of vein M_{3+4} about three-fourths as long as m crossvein, m crossvein slightly convex. *Abdomen:* Submetallic green, rather densely brown pollinose, thickly covered with black hairs, and with a row of long bristles at apex of each tergum. Abdomen slightly longer than head and thorax combined. Sides of fourth tergum not produced; fourth sternum convex at apex, subacutely pointed, but not having a ventral projection. Genitalia as in figure 53e.

Length: body, 3.2 mm.; wings, 4.0–4.2 mm.

Holotype male: Mt. Kaala, Oahu, 3,600 ft., March 6, 1938, taken on leaves of "ape ape" (*Gunnera petaloidea* Gaud.), at spring. (F. X. Williams).

Type in the Hawaiian Sugar Planters' Association collection.

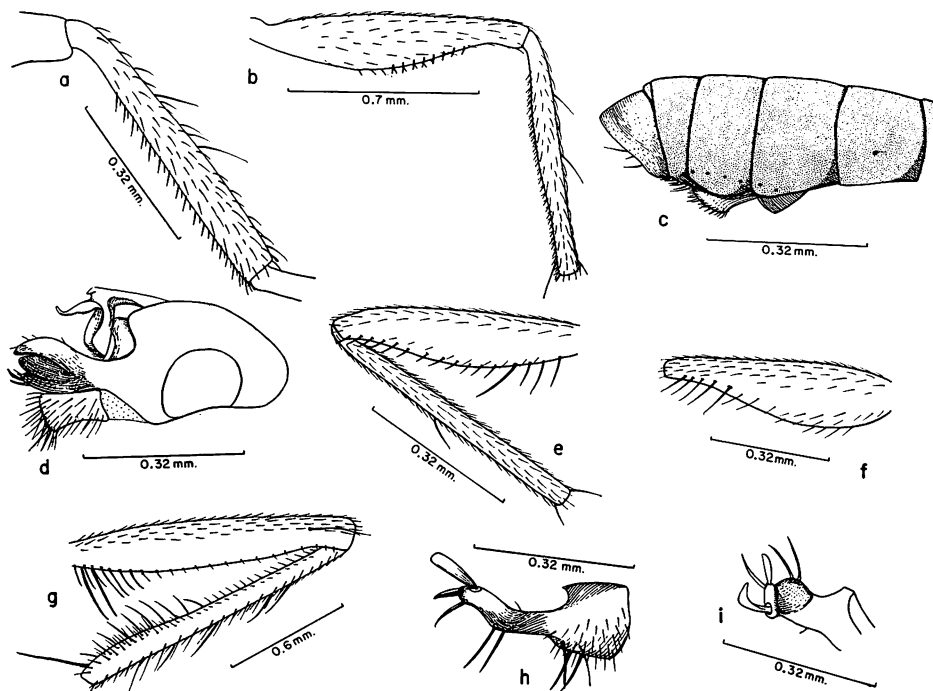


Figure 54—*Eurynogaster obscurifacies* Parent: a, front tibia of male; b, middle femur and tibia of male; c, male abdomen, lateral. *E. paludis* n. sp.: d, male genitalia; e, middle femur and tibia of male; f, front femur of male. *E. palustricola* n. sp.: g, middle femur and tibia of male; h, cercus of male, lateral view; i, top inner view of cercus.

***Eurynogaster obscurifacies* Parent (fig. 54a–c).**

Eurynogaster obscurifacies Parent, 1937, Proc. Haw. Ent. Soc. 10:244, figs. 26, 38.

Endemic. Oahu (type locality: Mt. Kaala). Known only from the type male and allotype female.

Type in Hawaiian Sugar Planters' Association collection, allotype in the Museum National d'Histoire Naturelle, Paris.

A rather small species, metallic green in ground color, moderately brown pollinose. Fitting in the group which has short stout ventral spines on front femora. It is distinguished from other species in this complex by lacking a projection on the fourth abdominal sternum of male and by having two well-developed dorsal bristles on each front tibia (fig. 54a).

Legs (type male) brown, tinged with yellow. Each front coxa with the usual row of apical bristles plus scattered small bristles and setae over the dorsal surface. These are longer and more abundant toward the apex. Each front femur with short stout bristles extending from just beyond the middle to near apical one-fifth; these are arranged roughly in two rows. Each middle femur with similar short, peg-like bristles arranged more definitely in two rows (fig. 54b). Front and

middle tibia each with two rows of closely spaced, short ventral bristles. Each front tibia with two dorsal bristles near middle and one preapical posterodorsal bristle. Each middle tibia with two dorsal bristles, one near basal third and one just beyond middle; also, with a posterodorsal bristle near basal fourth. Wings faintly gray fumose, almost hyaline. The last section of vein M_{3+4} slightly longer than m crossvein. The genitalia have not been dissected and we see nothing distinctive about them *in situ*, see figure 54c.

Length: body, 2.75 mm.

Eurynogaster paludis Hardy and Kohn, new species (fig. 54d-f).

Fitting in the groups of species which lack ventral spines or bristles on front femora or projections on the fourth segment of male and which have the pleura all dark colored, and the legs yellow. It fits near *E. tanyceraea* n. sp., but differs by having the third antennal segment not elongated, as well as by the bristling of the legs (fig. 54e). It differs from *E. clavaticauda* Van Duzee and *incompta* n. sp., from Oahu, by having a row of posterior bristles at apex of front femur and by having a very different arrangement of bristles on the middle legs (fig. 54e).

MALE. Rather small, submetallic species. *Head:* Face predominantly brown pubescent, gray on upper fourth; at its narrowest point it is equal in width to about three rows of eye facets. Front and vertex brownish gray. Labella yellow, tinged with brown, slightly less than one-fourth as long as the eye. Antennae black, third segment a little longer than wide. Arista short, about three-fourths longer than remainder of antenna. *Thorax:* Metallic green in ground color, moderately dusted with gray on the dorsum, rather densely so on the sides. Halteres bright yellow. *Legs:* Middle and hind coxae brown to black, densely gray pollinose, remainder of legs yellow except for brown apical segments of tarsi. Front coxae nearly bare above with only scattered fine pale hairs, excepting the strong bristles at apex. Each front femur with five posterior bristles just before the apex (fig. 54f). Hind legs without unusual bristles or long hairs. Each middle femur with a row of posteroventral bristles extending from the apex to about the basal one-fifth; one bristle situated just below the middle (fourth from base), is about two times longer and stronger than the others, its length about one-third greater than the width of the femur (fig. 54e). *Wings:* Almost hyaline. Cell R_5 scarcely narrowed apically, veins R_{4+5} and M_{1+2} almost parallel. Fourth costal section about one-half longer than fifth. Last section of M_{4+5} about equal to m crossvein. *Abdomen:* Entirely black, faintly metallic, rather densely gray to slightly brownish pollinose. Genitalia as in figure 54d.

Length: body, 1.8–2.0 mm.; wings, 2.2–2.3 mm.

FEMALE. Unknown.

Holotype male and one male paratype: Mt. Waialeale Trail, Kauai, 4,500 ft., August, 1953 (D. E. Hardy).

Type in the B. P. Bishop Museum; paratype in the University of Hawaii collection.

Eurynogaster palustricola Hardy and Kohn, new species (fig. 54g-i).

Fitting in the complex of species which has the male abdomen greatly enlarged at apex, the cerci exposed and very ornate, and the middle tibia with a large spine at apex. Close to *E. crassicercus* and best distinguished by the characteristic genitalia of the male (see fig. 54h-i); the cerci are very differently developed in the two species.

MALE. Predominantly dark-colored species, rather brightly metallic in direct light. *Head:* Face densely white pubescent, especially on the lower portion; at its narrowest portion it is about equal to the width of four rows of eye facets. Palpi gray, rather thickly dark-haired above. Lower portion of front dusted with brown, upper portion submetallic green or blue-green; vertex submetallic. Antennae dark brown to black. Third segment a little longer than wide. Arista inserted at or slightly below the middle on the dorsal portion of the third segment and about two and one-half times longer than remainder of antenna. *Thorax:* Mesonotum rather thickly brown pollinose, more gray around the sides; brightly metallic in the median portion. Pleura gray with a metallic green sheen. Halteres yellow. *Legs:* Predominantly dark brown to black, middle and hind tibiae tinged with yellow, coxae and femora gray pollinose with a distinct green sheen. Front coxae with numerous pale erect hairs above, with six or more black moderately developed bristles scattered over the lower half (besides the strong apical bristles). Front femora without strong bristles or long conspicuous hairs, but along the anteroventral surface they have two rows of short black setae extending from the apical two-fifths to the base of the segment and with a single row extending onto the apex; a row of about six very fine inconspicuous setae are also present on the posteroventral surface at the apical third of the segment. Each middle femur with two strong ventral bristles and four moderately developed anteroventrals situated near base of segment; also, with a row of rather weak anteroventral bristles extending to the apex of the segment; these diminish slightly in size as they progress distally. Posteroventral surface of middle femur with a row of short black bristles on apical third. Each middle tibia with about three rows of moderately strong black ventral bristles extending over their apical half; these are equal or slightly longer than the width of the tibia (fig. 54g), and a single row extending from the middle to the base of the segment; also with a row of moderately strong anterior bristles extending the entire length; with one moderately strong anterodorsal bristle near basal third and another near middle, and two posterodorsals situated near basal third of segment. Hind legs devoid of conspicuous bristles or long hairs except for the normal arrangement, each hind femur with a row of short, inconspicuous anteroventral setae. *Wings:* Hyaline or nearly so, cell R_5 narrowed apically. At the apex it is slightly over half as wide as in the median portion of the cell. Fourth costal section about two times longer than fifth. Last section of M_{3+4} approximately two-thirds as long as the m crossvein. *Abdomen:* Metallic green, dusted with brown or gray-brown

pollen. Genitalia as in figure 54h and 54i. Similar to *crassicercus* except for the details of the cercus.

Length: body, 3.5 mm.; wings, 3.7 mm.

FEMALE. The female has not definitely been associated with the male. One specimen on hand, same data as type, may belong here; but the legs are all yellow.

Holotype male: Alakai Swamp, Kauai, July 10, 1928 (E. H. Bryan, Jr.). One paratype male: same locality as type, 4,000 ft., August, 1953 (D. E. Hardy).

Type and the female specimen, in the B. P. Bishop Museum. Paratype in the University of Hawaii collection.

Eurynogaster parenti, new name (fig. 55a-d).

Pachyurus hawaiiensis Parent, 1934, Mem. Soc. Nat. et Math. de Cherbourg 41:305, pl. 79, figs. 16-18.

This is a *Eurynogaster* and the name *hawaiiensis* is preoccupied in this combination by *E. hawaiiensis* (Grimshaw). Parent was in error in considering this in the subfamily Hydrophorinae; the type has been studied in the British Museum collection by H. Oldroyd, and he confirms that it has a prescutellar depression and two large plus four small scutellar bristles.

?Gen. Nov. et sp. Grimshaw, 1901, Fauna Hawaiiensis 3(1):13. The specimen reported by Grimshaw was apparently later used as the type of *Pachyurus hawaiiensis* Parent.

Endemic. Kauai (type locality: Waimea Mts., 1894). Known only from the Kokee region.

Type in the British Museum (Natural History).

Fitting in the group of species which has the male abdomen enlarged apically, the genitalia large, conspicuous, and ornately developed (fig. 55b); and the middle tibia with a very long apical spur on venter. Related to *E. clavastyla* n. sp., but differing by having each front femur with two large ventral bristles near basal third and male cercus stout, without an attenuated stem (fig. 55b).

Rather large, metallic green or blue species, dusted with brown on the dorsum. Front and face metallic, the latter rather densely gray pubescent on lower portion. Halteres clear yellow. Coxae black, densely gray pollinose. Front and middle femora predominantly brown, narrowly yellow at bases. Hind femora brown on apical two-thirds with broad yellow bases. Each front femur with two rows of short, stubby black setae along posteroventral surface in addition to the strong ventral bristles mentioned above. Ventral surface of each middle femur with three strong, black, erect bristles near basal third and two rows of small bristle-like hairs extending the full length of the segment. Each middle tibia with a row of moderately strong, erect ventral bristles extending the entire length of the segment; the apical spine is about two-fifths as long as the basitarsus (fig. 55a). Hind femur with a row of hair-like anteroventral bristles on about the apical half of the segment. Also with a strong anterodorsal bristle at apical third. Wings light brown fumose, cell R_5 rather distinctly narrowed at apex. The

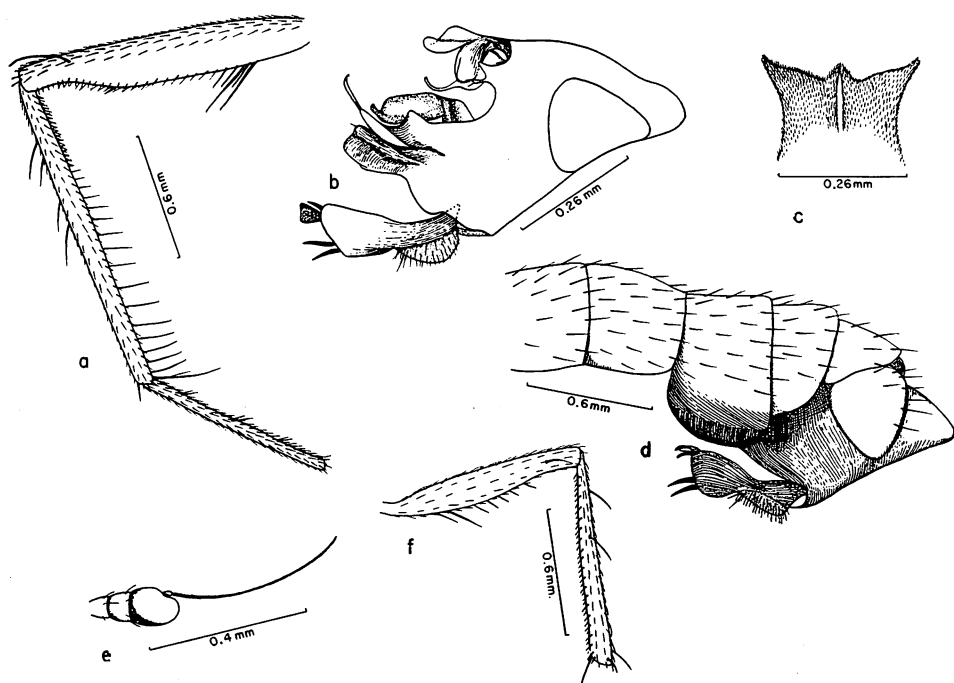


Figure 55—*Eurynogaster parenti* n. n.: a, middle femur, tibia, and basitarsus of male; b, male genitalia; c, claspers of male, dorsal view; d, abdomen of male, lateral view. *E. pulverea* n. sp.: e, antenna; f, middle femur and tibia.

fifth costal section is about one-half as long as the fourth. The last section of M_{3+4} is about one-half to three-fifths as long as the m crossvein. The apical portion of the abdomen is about two times broader than the basal portion. Genitalia as in figure 55b-d. Each cercus is broad with three prongs at apex; the basal portion is not noticeably narrowed.

Length: body and wings, 4.5–5.0 mm.

The female has not been recognized.

***Eurynogaster pulverea* Hardy and Kohn, new species (fig. 55e-f).**

Related to *E. clavaticauda* Van Duzee, but the middle tibiae are straight and lack anteroventral bristles or a clump of short ventral bristles at apex; also, the front femora have several small anteroventral bristles near bases.

MALE. Predominantly dull, faintly metallic. **Head:** Face brownish gray pubescent; at its narrowest point about equal in width to three or four rows of eye facets. Front brown, vertex and occiput brownish gray. Antennae black, third segment about as wide as long, rounded at apex (fig. 55e). Arista subapical, short pubescent, about two times longer than remainder of antenna. **Thorax:** Rather

densely gray pollinose, faintly shining. Halteres yellow. *Legs*: Predominantly yellow, all coxae brown covered with gray pollen, apical segments of tarsi brownish. Each front femur with four or five short anteroventral bristles near base of segment. Hind femora devoid of bristles or conspicuous hairs below. Each middle femur with a row of seven posteroventral bristles arranged near middle of segment (extending from about apical third to basal third); the second bristle from the base is the strongest. Each middle tibia with about two rows of erect, short, ventral setae extending the entire length of the segment; anterior bristles strong, situated just above middle of segment, about one-fourth the length of the segment from the dorsal bristle (fig. 55f). *Wings*: Faintly brown fumose. Cell R_5 slightly narrowed apically, veins R_{4+5} and M_{1+2} almost parallel. Fourth costal section about two times longer than fifth. Last section of vein M_{3+4} about three-fourths as long as the m crossvein. *Abdomen*: Entirely gray to brownish gray pollinose, faintly metallic green or coppery. The genitalia have not been dissected or relaxed for study; they appear to have a number of long strong hairs at apices of cerci.

Length: body, 2.3 mm.; wings, 2.6 mm.

FEMALE. Lacking the ornamentations of the legs and the face is broader (about equal in width to seven rows of eye facets); otherwise similar to the male.

Length: body, 2.4 mm.; wings, 2.9 mm.

Holotype male, allotype female, and one paratype female: Kokee, Kauai, July, 1937 (the allotype labeled "beating, *Alyxia*"), (E. C. Zimmerman).

Type and allotype in the B. P. Bishop Museum. Paratype in the University of Hawaii collection.

***Eurynogaster retrociliata* Parent (fig. 56a-c).**

Eurynogaster retrociliata Parent, 1939, Proc. Haw. Ent. Soc. 10:244, figs. 40-41.

Endemic. Oahu (type locality: Tantalus Crater). Found in the Koolau and Waianae Mountains of Oahu.

Type in the Hawaiian Sugar Planters' Association collection.

Fitting close to *E. cilifemorata* Parent. Differing by having yellow halteres and by the development and chaetotaxy of the legs; middle femora each with a small preapical bump below, midtibiae distinctly curved, and preapical bristles of hind tibiae erect, at right angles to tibia; the middle tibiae are rather sinuate, more distinctly swollen at basal third, and the bristling of hind femur is different (fig. 56b).

The details of the body and leg coloration and wing venation fit those of *cilifemorata* except for the bright yellow halteres. Each middle femur has the apical half rather thickly bristled on venter (15 to 18 rather short thick bristles); these are arranged in two irregular rows near middle of segment. Middle tibia as in figure 56c. Hind femur each with a row of about eight long anteroventral hairs extending from approximately the basal sixth to the apical two-fifths of the segment; also with four long bristles arranged irregularly on the ventral sur-

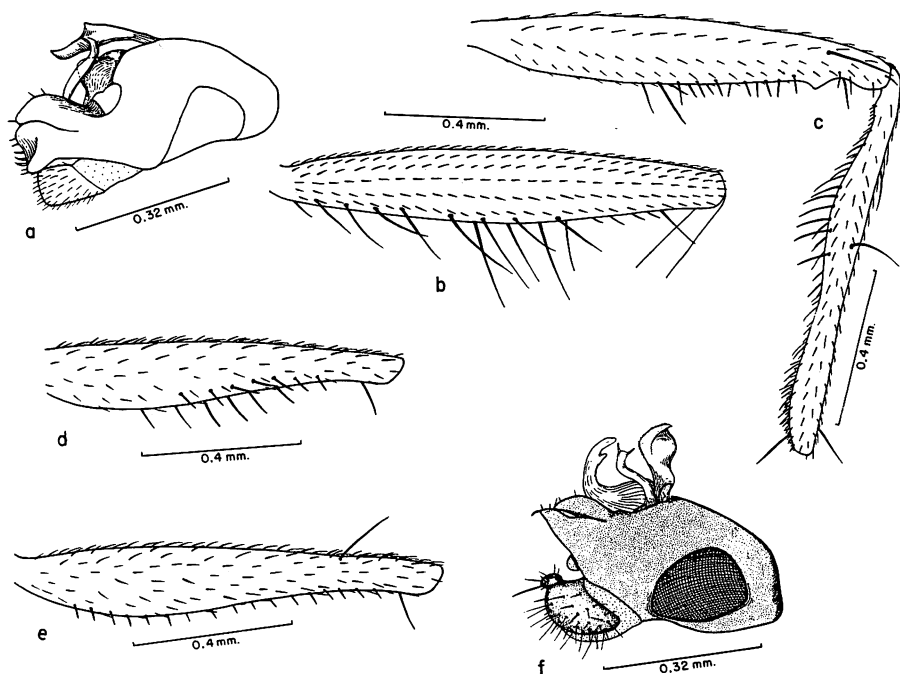


Figure 56—*Eurynogaster retrociliata* Parent: a, male genitalia; b, hind femur of male; c, middle femur and tibia of male. *E. saxatilis* (Grimshaw): d, front femur of male; e, middle femur of male; f, male genitalia.

face near apical third and a row of six to eight slender, pale-colored hairs on posteroventral surface near middle of segment. Apical bristles of hind tibia erect, characteristically standing at right angles to the tibia (note: these are slightly preapical in position; one is dorsal, the other is posterodorsal). Genitalia as in figure 56a.

Length: 2.0–2.2 mm.

***Eurynogaster saxatilis* (Grimshaw), new combination** (fig. 56d–f).

Chrysotus saxatilis Grimshaw, 1901, Fauna Hawaiiensis 3 (1):16.

Eurynogaster luteihalteredata Parent, 1939, Proc. Haw. Ent. Soc. 10:242, figs. 27, 28. **New synonymy**, based upon comparison of type (in British Museum) with the type of *saxatilis* Grimshaw.

Endemic. Oahu (type locality: Mt. Kaala). Known only from the Waianae Mountains, Oahu.

Type in the British Museum (Natural History).

This fits in the group of species which has short, stout ventral spines on the front femora, a short pointed projection at middle of hind margin of fourth

sternum of male, and clear yellow halteres. It is very closely related to *viridifacies* Parent, but appears to differ by having the legs chiefly metallic green, by being slightly larger, by having six to eight well-developed anteroventral bristles on front femur, and by having about 16 rather short, stout posteroventral bristles on middle femur.

A rather brightly metallic green or blue-green species characterized by the details given above and shown in figure 56d-f. The legs vary from brown, tinged with yellow, to black with a distinctly metallic green sheen, especially on the femora and tibiae.

Length: 2.50-2.75 mm.

Eurynogaster spiniger (Grimshaw), new combination (fig. 57a-b).

Chrysotus spiniger Grimshaw, 1901, Fauna Hawaiiensis 3:15, pl. II, figs. 1, 2, 2a.

Endemic. Maui (type locality: Haleakala), and Lanai (Lanaihale, 3,200 ft.). Type in British Museum (Natural History).

An entirely dark-colored species fitting in the group which lacks ornamentation on the front or hind femora or on the third abdominal segment of the male. Fitting close to *E. furva* n. sp. and *kauaiensis* n. sp. but distinguished by having the anterior bristle of the middle tibia situated at the apical third of the segment and separated from the dorsal bristle by half the length of the tibia; also by the difference in the bristling of the middle femur as shown in figure 57b.

MALE. *Head*: Face entirely gray pubescent; at its narrowest point it is about equal in width to four rows of eye facets. Front and vertex brownish gray, not polished. Antennae black, third segment rather cone-shaped, approximately two times longer than wide, tapered to apex. Arista short, about two times longer than third antennal segment. *Thorax*: Rather densely gray pollinose, slightly brownish on the apical two-fifths of the mesonotum and over the scutellum, faintly subshining green in ground color. Halteres clear yellow. *Legs*: Predominantly dark brown to black. Front and middle tibiae and extreme apices of femora yellowish in ground color. The posteroventral surface of each middle femur with two strong bristles situated near basal fourth followed by four or five shorter bristles near the middle of the segment and two or three tiny bristles at apical one-third. Each middle tibia with three to five strong anteroventral bristles situated at middle and a strong anterior bristle at apical third (fig. 57b). *Wings*: Faintly fumose. Veins R_{4+5} and M_{1+2} parallel. Fourth section of costa about one-third longer than fifth. Last section of M_{3+4} equal or slightly longer than m crossvein. *Abdomen*: Rather thickly gray dusted, faintly metallic. Genitalia as in figure 57a.

Length: body, 2.5 mm.; wings, 2.6 mm.

FEMALE. Fitting the description of the male except for sexual differences and lacking the bristling of the middle legs. The front at its narrowest point is about equal in width to eight or nine rows of eye facets.

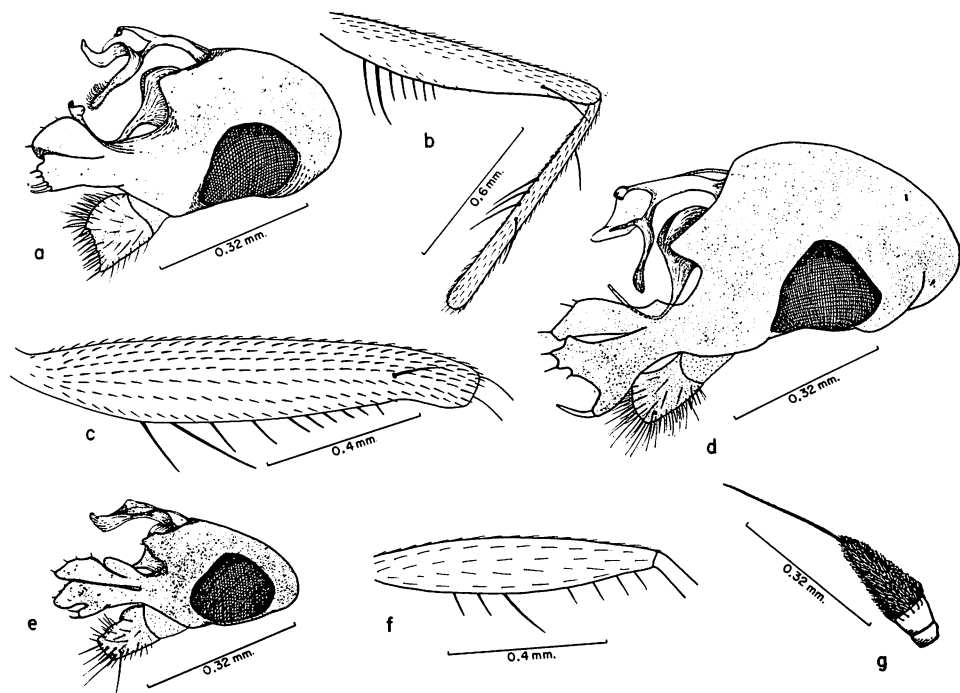


Figure 57—*Eurynogaster spiniger* (Grimshaw): a, male genitalia; b, middle femur and tibia. *E. subciliata* n. sp.: c, middle femur of male; d, male genitalia. *E. tanyceraea* n. sp.: e, male genitalia; f, middle femur of male; g, antenna.

***Eurynogaster subciliata*, new species (fig. 57c–d).**

Fitting close to *E. clavaticauda* Van Duzee but differing by having the middle tibia straight, the anteroventral bristles rather small, ventral bristles of middle femur extending to a point nearly on a level with preapical anterior bristle, and hind femur with a row of short but distinct, erect anteroventral hairs.

MALE. *Head:* Face and palpi densely gray pubescent; the latter rather thickly covered with short bristles, the former about equal in width to three rows of eye facets at its narrowest point. Front, gray-brown; vertex and occiput, gray. Antennae black, third segment slightly longer than wide, rounded at apex. Arista dorsal, short pubescent, two and one-half to three times longer than remainder of antenna. *Thorax:* Submetallic blue or green, gray-brown pollinose on the dorsum, gray on the sides. Halteres clear yellow. *Legs:* Predominantly yellow. Front coxae yellow except for faint discolorations of brown on outer surface near bases, mid and hind coxae yellow-brown to black in ground color, densely gray pollinose. Apices of hind tibiae and apical segments of tarsi brownish. Front coxae with scattered, pale, very fine hairs on dorsal surface in addition to the row of strong bristles at apex. Front femora bare on ventral surfaces. Each middle femur with a row of rather strong posteroventral bristles arranged from about the basal one-fourth to the apical one-fifth, ending just slightly before the preapical an-

terior bristle; the two basal bristles are the largest (fig. 57c). The anteroventral surface of each middle tibia has a row of three to five rather short, erect bristles and numerous suberect hairs or bristle-like hairs situated near the middle; the anterior bristle is situated in the middle of the segment. Each hind femur has a row of anteroventral hairs or small hair-like bristles extending almost the entire length of the segment; the longest of these is scarcely over half the width of the femur. *Wings*: Faintly fumose. Cell R_5 slightly narrowed apically. Fourth costal section two times longer than fifth. Last section of M_{3+4} about two-thirds as long as m crossvein; m crossvein slightly convex. *Abdomen*: Submetallic green, brownish gray pollinose. Genitalia as in figure 57d.

Length: body, 3.0 mm.; wings, 3.4 mm.

FEMALE. Fitting the description of the male except for leg bristling and the usual sexual characters; the face is about equal in width to seven or eight rows of eye facets.

Length: body, 3.2 mm.; wings, 3.6 mm.

Holotype male, allotype female, and six paratypes (three males and three females): Puu Kaaumakua, Oahu, 2,700 ft., Koolau Mts., April, 1952 (E. Dresner).

Type and allotype in B. P. Bishop Museum, paratypes in the following collections: U. S. National Museum, Hawaiian Sugar Planters' Association, and the University of Hawaii.

***Eurynogaster tanyceraea* Hardy and Kohn, new species (fig. 57e-g).**

Fitting in the group of species which lacks bristles or spines on front femora, or processes on the fourth segment of male; which has yellow legs, and the pleura entirely dark colored. It fits nearest to *E. paludis* n. sp., from Kauai, but has the third antennal segment elongated (three times as long as wide) and the bristles of the middle femora are very different in development (fig. 57f).

MALE. A rather small, faintly metallic species. *Head*: Face rather densely gray pubescent, about equal in length to four rows of eye facets. Front and vertex brownish gray, shining only around the ocellar triangle. Antennae dark brown to black, third segment cone-shaped about four times longer than wide, with rather long gray pubescence around the margin. Arista short, about one-half longer than third segment (fig. 57g). *Thorax*: Mesonotum almost entirely gray pollinose, faintly metallic green in ground color. Halteres yellow. *Legs*: Mid and hind trochanters brown to black, legs otherwise yellow. Front and hind legs devoid of conspicuous bristles or hairs. Each middle femur with three black posteroventral bristles situated near basal third, the two proximal bristles short, the distad bristle rather large, equal or slightly longer than the width of the femur, and with four short, black posteroventral bristles at apical third (fig. 57f). Middle tibiae straight, without unusual bristles or hairs. *Wings*: Almost hyaline. Cell R_5 scarcely narrowed in the apical portion. Fourth costal section about one-half longer than fifth. Last section of vein M_{3+4} equal to m crossvein. *Abdomen*: Entirely black, covered with brown pollen, and rather thickly black-haired, slightly shining in ground color. Genitalia as in figure 57e.

Length: body, 1.7 mm.; wings, 2.3 mm.

FEMALE. Unknown.

Holotype male: Puu Alii, Molokai, 4,200 ft., July, 1953 (D. E. Hardy). Type in the B. P. Bishop Museum.

***Eurynogaster tergoprolixa* Hardy and Kohn, new species (fig. 58a-c).**

This fits in the group of species which lacks ventral spines or bristles on front femora and which has a process developed from each lateral margin of the fourth tergum of the male (fig. 58b). It differs from related species by having only three long, pale ventral bristles near base of each middle femur (fig. 58a) rather than with ventral bristles on the entire length. It fits near *E. virida* Van Duzee but the male cerci and remainder of genitalia are not as ornately developed, the fourth tergum is not concave, and the other details are very different; the two species are not related.

Predominantly submetallic green species. *Head*: Face densely gray pubescent; very narrow, at its narrowest point about equal in width to two rows of eye facets. Vertex and upper portion of front submetallic green, lower portion of front brown pollinose. Antennae dark brown to black, third segment about as wide as long. *Thorax*: Subshining green on dorsum, rather thickly brown pollinose; pleura gray, faintly metallic. Halteres yellow, very slightly discolored with brown on the knobs. *Legs*: Predominantly yellow, middle and hind coxae brown to black in ground color, densely gray pollinose, apices of hind femora discolored with brown, especially on the upper portions. Each front coxa with fine yellow hairs scattered over the dorsal portion, plus a row of yellow bristles at apex. Front femora and tibiae devoid of bristles or conspicuous hairs, except for a single tiny preapical anteroventral and a posteroventral bristle on each femur. Each middle coxa with a strong, yellow-brown, flattened ventral bristle at apex, extending approximately the length of the trochanter. Each middle femur with three long, rather flattened, yellow to brownish-yellow ventral bristles near basal fourth. The longest of these is nearly two times longer than the width of the femur (fig. 58a). The middle tibiae are straight; each has numerous erect yellow-brown ventral setae extending the entire length of the segment. These are approximately equal in length to the width of the tibia. Anterior bristle of hind coxa yellow to brownish yellow, rather strong, almost equal in length to the larger of the ventral bristles on middle femora. Hind femora devoid of bristles or conspicuous setae, except for the anterior bristles near apical fourth. Each hind tibia with one small posterodorsal near basal fourth and one small antero-dorsal near middle plus the three small apical bristles. *Wings*: Hyaline or nearly so, fourth costal section about one-half longer than fifth. Veins M_{1+2} and R_{4+5} nearly parallel. Last section of M_{3+4} about two-thirds as long as m crossvein. *Abdomen*: Submetallic green, rather densely brown pollinose; about as long as head and thorax combined. Lateral margins of fourth tergum produced into a bilobed process (fig. 58b). Genitalia as in figure 58c.

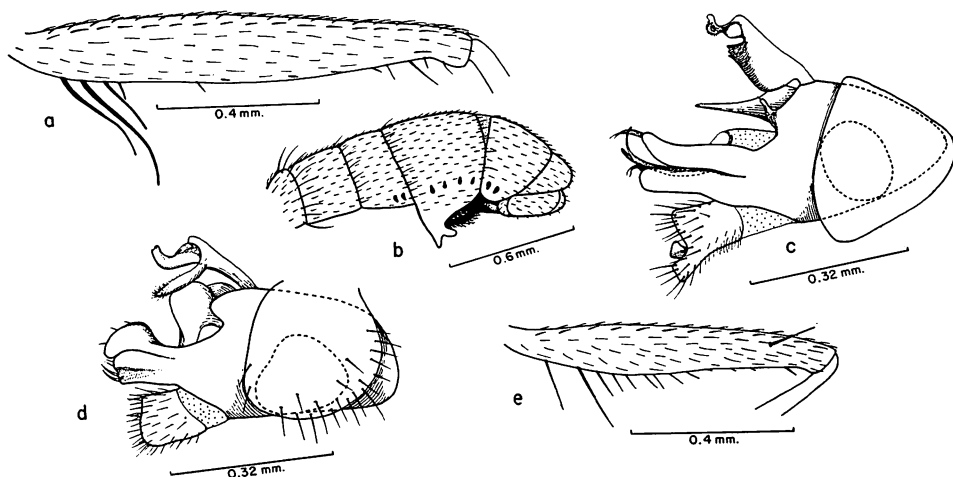


Figure 58—*Eurynogaster tergoprolixa* n. sp.: a, middle femur of male; b, abdomen of male, lateral; c, male genitalia. *E. variabilis* n. sp.: d, male genitalia; e, middle femur of male.

Length: body, 2.0–2.4 mm.; wings, 2.4–2.7 mm.

FEMALE. Similar to the male, except for the sexual characters and except that the middle legs lack the ventral bristles or cilia. Also, the front is broad, about equal in width to ten rows of eye facets, and the mesonotum is more gray pollinose.

Holotype male: Puu Kolekole, Molokai, 3,600 ft., July, 1952 (D. E. Hardy). **Allotype female:** same locality and date as type (M. Tamashiro). Nearly 200 paratypes (the sexes about evenly divided) from the following localities on Molokai: same as type (D. E. Hardy and M. Tamashiro); Manawainui Val., July, 1952, to August, 1953 (D. E. Hardy and M. Tamashiro); Kahuaawi Gulch, July, 1952 (D. E. Hardy); Puu O Kaeha, 3,700 ft., July, 1953 (D. E. Hardy and M. Tamashiro); Puu Kaeo, July, 1952 (M. Tamashiro); Puu Alii, 4,200 ft., July, 1952 (D. E. Hardy and M. Tamashiro). Also two males from Mt. Kaala, Oahu: one, taken May 8, 1938, sweeping on path between 3,000–3,600 ft. (F. X. Williams); the other, taken March, 1952 (D. E. Hardy).

This species is very common on the ground litter in the wet mountainous areas of Molokai and in the Waianae Range of Oahu.

Type, allotype, and a series of paratypes in B. P. Bishop Museum. Remainder of paratypes distributed among the following collections: U. S. National Museum, British Museum (Natural History), Hawaiian Sugar Planters' Association, State Department of Agriculture, and the University of Hawaii.

***Eurynogaster variabilis* Hardy and Kohn, new species (fig. 58d–e).**

An entirely dark-legged species fitting in the group which lacks ventral bristles or cilia on the front or hind femora or ornamentations on the third abdom-

inal segment of male. It fits near *E. angustifacies* n. sp. but differs from this species by having the third antennal segment cone-shaped and about two times longer than wide, the face whitish pubescent and rather broad, and the ventral bristles of middle femora arranged before the middle of the segment (fig. 58e).

MALE. *Head:* Face and palpi densely white pubescent. Front and vertex brown. Antennae black, third segment rather cone-shaped, almost two times longer than wide, with a dense fringe of gray pubescence around the apex. Arista subapical, very short pubescent, and about two times longer than remainder of antenna. *Thorax:* Rather densely gray pollinose on the front portion and over the pleura, posterior two-fifths of mesonotum and all of the scutellum light brown pollinose, with a distinct coppery sheen. Halteres clear yellow. *Legs:* Predominantly brown to black, coxae gray pollinose, femora lightly grayed. Posteroventral surface of middle femur with two rather well-developed bristles near basal one-fifth and about six or seven hair-like bristles which extend just slightly beyond middle of segment. Each middle tibia with a large anterior bristle at middle of segment and in the typical form with no anteroventral bristles. In a few individuals from the type locality, and other localities, moderate to fairly well-developed anteroventral setae or bristles are present on middle tibia; in a long series of species from Kaiholena, Hawaii, and from the top of the mountain on Molokai, the males consistently have two well-developed anteroventral bristles. This seems to be a variable character in this species; these individuals appear to be alike in all other respects. The specimens from Molokai, however, have the third antennal segment slightly shorter than do those from Hawaii, but the difference does not seem significant. *Wings:* Very faintly fumose, cell R_5 slightly narrowed apically. Fourth costal section almost two times longer than fifth. Last section of M_{3+4} equal in length to the m crossvein; m crossvein slightly convex. *Abdomen:* Submetallic bronze, rather densely gray to brownish gray pollinose. Genitalia as in figure 58d.

Length: body, 2.1–2.3 mm.; wings, 2.2–2.5 mm.

FEMALE. Similar to the male except for lack of ventral bristles on the middle legs and for genital characters. Also, the mesonotum is chiefly brownish gray pollinose and the face is slightly brownish down the median portion; at its narrowest point the face is equal in width to about eight or ten rows of eye facets.

Holotype male and allotype female: Olaa Flume Road, Hawaii, 1,500 ft., August, 1952 (W. C. Mitchell). One hundred eighty-four paratypes (sexes about evenly distributed) from the following localities: same as type (W. C. Mitchell and D. E. Hardy); Upper Olaa Forest, Hawaii, August, 1952, and July, 1953 (D. E. Hardy and W. C. Mitchell); Napau Crater, Kilauea, Hawaii, July, 1953 (D. E. Hardy); Kahuku Ranch, Hawaii, 3,000 ft., July, 1953 (D. E. Hardy); Kulani, Hawaii, 5,200 ft., August, 1952 (W. C. Mitchell); Hawaii National Park, Hawaii, August, 1952 (D. E. Hardy); north slopes of Hualalai, Hawaii, 4,000–6,000 ft., July, 1953 (D. E. Hardy); Lower Olaa Forest, Hawaii, August, 1952 (D. E. Hardy); Waikii, Hawaii, August, 1949 (D. E. Hardy); Kaiholena, Hawaii, Kohala Mts., 4,000 ft., August, 1952 (D. E. Hardy and W. C. Mitchell); Puu

Kolekole, Molokai, 3,600 ft., July, 1952 (D. E. Hardy and M. Tamashiro); Manawainui Valley, Molokai, July, 1952 (D. E. Hardy); Puu O Kaeha, Molokai, July, 1953 (D. E. Hardy); Waikolu Valley, Molokai, 1,400 meters, April–May, 1955 (C. R. Joyce); Mt. Kaala, Oahu, 4,000 ft., August, 1945 (W. W. Wirth).

Type, allotype, and a series of paratypes in the B. P. Bishop Museum. Remainder of paratypes distributed among the following collections: U. S. National Museum, British Museum (Natural History), Hawaiian Sugar Planters' Association, State Department of Agriculture, and the University of Hawaii.

Two specimens (a male and a female) from Puu Kukui, Maui, 3,000–4,500 ft., June, 1953 (D. E. Hardy), appear to belong here. There is just a slight indication of anteroventral bristles on the middle tibiae of the male.

***Eurynogaster virida* Van Duzee (fig. 59a–d).**

Eurynogaster virida Van Duzee, 1933, Proc. Haw. Ent. Soc. 8:342.

Sweziella albifacies Van Duzee, 1933, Proc. Haw. Ent. Soc. 8:346.

Endemic. Oahu (type locality: Mt. Kaala). Known only from the type locality and Makaleha, Waianae Mountains.

Type in the Hawaiian Sugar Planters' Association collection.

Van Duzee described what he thought were two species from two "males" taken on Mt. Kaala, Oahu. The types have been studied in the Hawaiian Sugar Planters' Association collection; they are both females. Slight distortion of the sterna of one of these accounts for the differences Van Duzee showed in his figures. His drawings are incorrect; the lobes shown are the lobes of the ovipositor. This is one of the largest of the *Eurynogaster*, is a rapid flying species rather common on leaves of plants in the wet sections of the Waianae Mountains.

Distinguished from other species by the ornamentation of the middle legs, by the concave hind margin of fourth tergum of male (fig. 59d); by the male genital characters, and by the reduction of the anal area of the wing.

Metallic blue-green or bronze, dusted with gray. Legs predominantly yellow, middle and hind coxae and tarsi (especially middle and hind pairs) brown; hind tibiae often tinged with brown, and upper edge of hind femora of male discolored with brown. Front femora lacking ventral spines or bristles. Each middle femur of male with a row of three long bristles and a dense clump of short black bristles just before base, the long bristles posteroventral and the short ones mostly ventral in position; the middle femora are otherwise completely bare on ventral surface except at extreme apices (fig. 59b). Middle tibiae slightly swollen apically, densely covered on ventral surface with short erect hairs, each with a small anterodorsal and a small posterodorsal bristle near basal fourth. No distinct anal lobe developed in wing (fig. 59a). Male genitalia very large and ornate. Anterior lateral margins of fourth tergum developed on the venter into forcipate projections. Cerci black, densely black-haired, and each produced into a slender lobe at apex (fig. 59c).

Length: body, 3.5–4.2 mm.; wings, 4.3–5.0 mm.

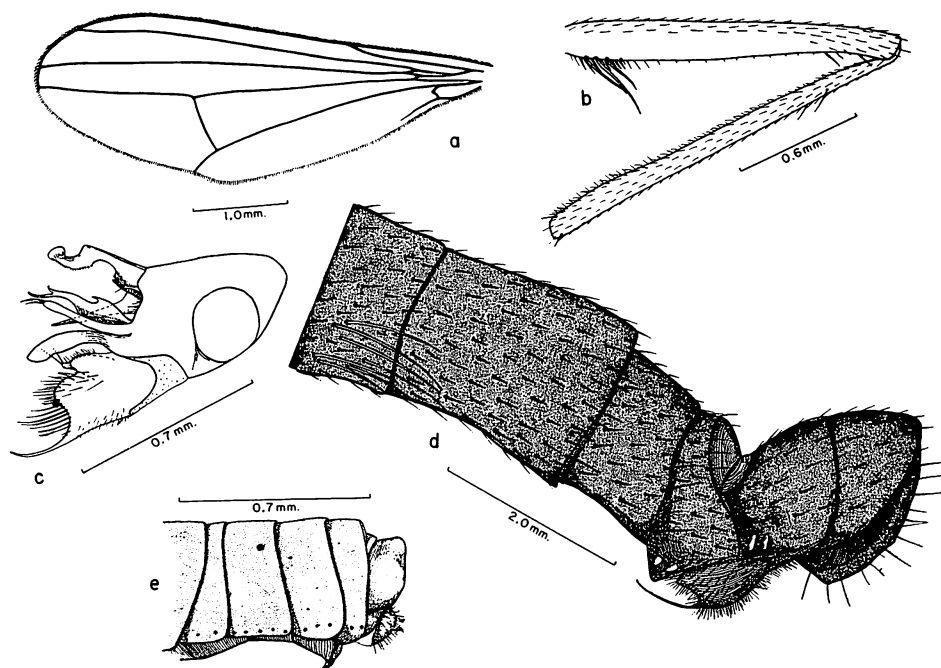


Figure 59—*Eurynogaster virida* Van Duzee: a, wing; b, middle femur and tibia; c, male genitalia; d, male abdomen, lateral. *E. viridifacies* Parent: e, abdomen of male, lateral.

***Eurynogaster viridifacies* Parent (fig. 59e).**

Eurynogaster viridifacies Parent, 1938, Konowia 16:209, figs. 18–21.

Endemic. Oahu (Kukuiala Valley, Waianae Mts.). It occurs in both the Waianae and Koolau Mountains; the adults are found sitting on leaves and dripping wet banks in the sun. Williams (1939:298) says it is one of the most abundant of the *Eurynogaster*.

Type in British Museum (Natural History).

A rather small, brightly metallic green or blue-green species closely related to *E. saxatilis* (Grimshaw). It differs by having the legs predominantly yellow, not metallic green; each front femur has four or more well-developed anteroventral bristles plus one or two tiny preapical bristles; and the middle femur has about twelve small, rather hair-like posteroventral bristles. The genitalia seem to fit those of *saxatilis*, and we see no other distinctive characteristics for separating this species. Parent's figure 19 (1938) is not correct. He shows a projection coming off the venter of the fourth tergum. Actually this projection comes from the posterior median margin of the sternum as in figure 59e.

Length: 2.25 mm.

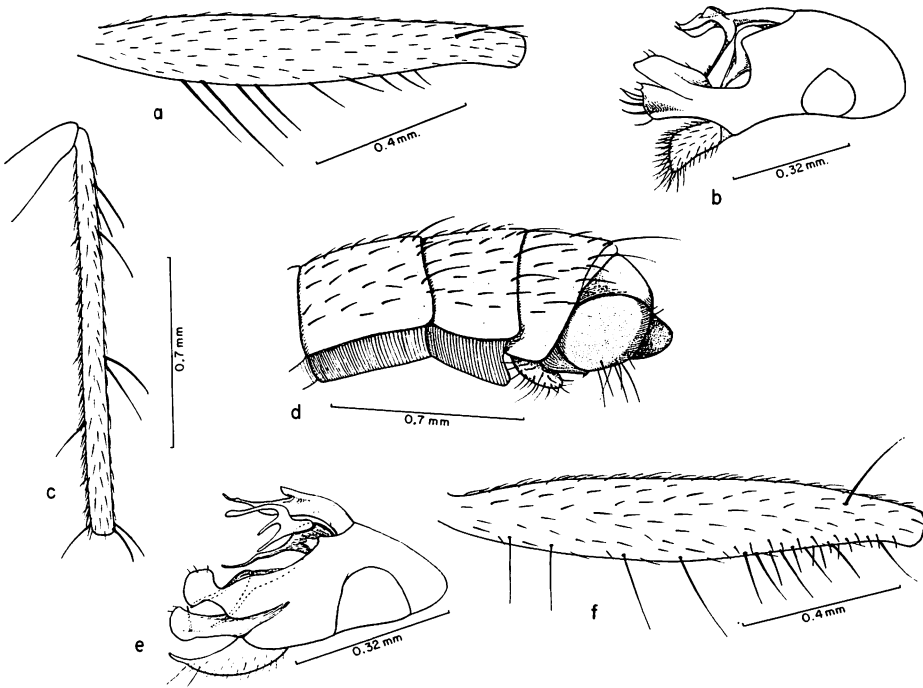


Figure 60—*Eurynogaster vittata* n. sp.: a, middle femur of male; b, male genitalia. *E. williamsi* n. sp.: c, middle tibia of male; d, abdomen of male, lateral. *E. xanthopleura* n. sp.: e, male genitalia; f, middle femur of male.

***Eurynogaster vittata* Hardy and Kohn, new species (fig. 60a–b).**

A black-legged species lacking spurs or bristles on front femora or ornamentations on the fourth abdominal segment of male. It is distinguished from other known *Eurynogaster* by having two gray and three brown vittae extending longitudinally down the mesonotum.

MALE. *Head:* Face entirely silvery, densely pubescent; at its narrowest point it is about equal in width to seven rows of eye facets. Front, vertex, and occiput predominantly silvery gray, brown around the ocellar triangle and in the upper median portion of the occiput. Antennae black, third segment about one-third longer than wide. Arista subapical, about three-fourths longer than remainder of antenna. *Thorax:* Predominantly silvery gray with a median and two lateral brown vittae extending down the mesonotum. Scutellum, pleura, and metanotum densely gray. Thorax with just a faint metallic sheen. Halteres brown to black. *Legs:* Predominantly black, extreme apices of femora and bases of tibiae narrowly yellow. Front and hind legs without unusual bristles or long hairs. Each middle femur with a row of nine or ten anteroventral bristles extending from near the basal fourth to about the apical sixth of the segment (fig. 60a); the second

hair from base is the largest; the others diminish in size toward the apex of the segment. Each middle tibia has a row of four anteroventral bristles situated just before the middle. *Wings*: Light brown fumose. Cell R_5 slightly narrowed apically; the last section of vein M_{1+2} curved upward slightly just beyond the m crossvein. Fourth costal section about two-thirds longer than the fifth. Last section of vein M_{3+4} about three-fourths as long as m crossvein. *Abdomen*: Entirely black, brown pollinose on the dorsum, gray on the sides, with a distinct metallic green or coppery sheen on the dorsum. Genitalia as in figure 60b.

Length: body, 3.2 mm.; wings, 3.3 mm.

FEMALE. Fitting the description of the male except for the genital differences and for the lack of ornamentation on the middle legs. The face is broad, equal in width to 12 or 14 rows of eye facets.

Length: body, 3.1 mm.; wings, 3.4 mm.

Holotype male: Holua, Haleakala Crater, Maui, June, 1953 (D. E. Hardy). **Allotype female**: Hana, Maui, June, 1953 (C. R. Joyce). Seven paratypes: one male, one female, same data as type (D. E. Hardy and C. R. Joyce); one male, three females, Paliku, Haleakala Crater, Maui, 6,500 ft., June, 1953 (D. E. Hardy and C. R. Joyce); and one female, Haleakala, Maui, on *Sadleria* fern, 6,100 ft., July 18, 1919 (no collector given).

Type and allotype in the B. P. Bishop Museum. Paratypes in the following collections: U. S. National Museum, Hawaiian Sugar Planters' Association, and the University of Hawaii.

***Eurynogaster williamsi* Hardy and Kohn**, new species (fig. 60c-d).

Closely related to *E. hispida* n. sp. but differing by having the ventral portions of all femora yellow, the anteroventral hairs of middle femora extending the entire length of segment, a strong anteroventral bristle present on apical third of middle tibia, and the ventral surface of middle tibia densely covered with erect setae.

MALE. *Head*: Face metallic purple in ground color, rather thickly gray pubescent; at narrowest portion the face is about equal to six or seven rows of eye facets. Labella yellow, tinged with brown. Front and vertex metallic green to blue or purple, rather thickly covered with gray-brown pubescence. Eyes densely covered with long pubescence. Antennae black, third segment about one-third longer than wide, somewhat narrowed apically but not acute. Arista dorsal, situated toward the base of the third segment, rather long pubescent and about three times longer than remainder of antenna. *Thorax*: Metallic blue-green or purple in ground color, rather lightly brown pollinose on the dorsum, densely gray on the sides. Halteres yellow. *Legs*: Predominantly brown. Ventral portions of femora and all of front and middle tibiae yellow. Middle femora with anteroventral hairs extending the entire length of the segment and middle tibia with a strong anteroventral bristle near apical third. Each middle tibia with numerous erect hairs extending along the entire ventral surface (fig. 60c). The

other bristles of the mid and hind tibiae are as in *hispid*a. *Wings*: Light brown fumose, veins R_{4+5} and M_{1+2} parallel. Fourth section of costa about one-fourth longer than fifth. Last section of M_{3+4} about three-fourths to four-fifths as long as the m crossvein. *Abdomen*: Submetallic green to blue-black in ground color, rather densely brownish gray pollinose, about equal in length to the head and thorax combined; with long bristles at apices of segments and entire abdomen densely covered with short suberect setae. Genitalia as in figure 60d.

Length: body, 3.0–3.2 mm.; wings, 3.5 mm.

FEMALE. Unknown.

Holotype male: taken at spring near Wailau Pass, Molokai, 2,800 ft., December 19, 1937 (F. X. Williams).

Type returned to the Hawaiian Sugar Planters' Association collection.

Eurynogaster xanthopleura Hardy and Kohn, new species (fig. 60e–f).

Fitting in the group of species which lacks bristles or long ciliation on front femora or projections on fourth abdominal segment of male and which has the legs and pleura predominantly yellow. It differs from others in this complex (*E. dolichostoma* n. sp. and *flaviventer* n. sp.) by having the apices of hind femora discolored with brown, the pleura entirely yellow, and also by the differences in leg bristling and male genitalia as shown in figure 60e and f.

MALE. *Head*: Face densely gray pubescent. At its narrowest point it is equal in width to four or five rows of eye facets. Palpi densely gray with short black bristles above. Front and vertex predominantly gray, subshining black, faintly metallic on the ocellar triangle. First two antennal segments yellow, third yellow-brown, as wide as long. Arista rather long pubescent, about three times longer than remainder of antenna. Labella yellow-brown, well developed, the portion extending beyond eyes is slightly over half the length of the eye. *Thorax*: Predominantly yellow, ground color of mesonotum and scutellum chiefly polished black covered with dense brownish gray pollen, metallic only in the central portion. Humeri, lateral margins of mesonotum, and all of pleura except for a small black spot just before wing bases, all yellow. Metanotum yellow, sometimes faintly tinged with brown on the sides. Sides of scutellum yellow in ground color. Halteres bright yellow. *Legs*: Predominantly yellow, hind coxae reddish brown, hind femora with brown discolorations just before the apices, apical segments of tarsi yellow-brown. The tibiae and tarsi are densely covered with short black hairs, somewhat obscuring the yellow ground color and causing them to appear more darkly colored than is actually the case. Front coxae rather densely covered with short, suberect, yellow-brown hairs on dorsal surface in addition to the row of strong, black bristles at apex. Front and hind legs without bristles or conspicuous hairs, except for the normal arrangement. Each middle femur with four slender, rather elongate (their length equal to width of femur), brown to black bristles situated near middle of segment and with about six shorter black bristles extending to apex; also with a rather dense clump of short black bristles arranged

over the ventral surface, concentrated on the apical third of the segment (fig. 60f). Ventral surface of middle tibia densely covered with short, fine hairs over the entire length; these are not as brush-like as in *dolichostoma*. Hind femora stout, rather strongly thickened. *Wings*: Very faintly fumose, almost hyaline. Fourth costal section two times longer than fifth. Cell R_5 just slightly narrowed apically, veins R_{4+5} and M_{1+2} are almost parallel. Last section of M_{3+4} just slightly shorter than m crossvein. *Abdomen*: First segment entirely yellow; terga two to four with yellow sterna and yellow on the sides of terga. Abdomen otherwise dark brown to black, faintly shining, dusted with gray-brown pollen, and rather thickly black haired. Genitalia well developed, as in figure 60e.

Length: body, 2.8–3.0 mm.; wings, 3.5–3.7 mm.

FEMALE. Like the male except for genital characters and for the normal differences in the leg bristling.

Holotype male and allotype female: Kawaikoi Stream, Kauai, 3,700 ft., August, 1953 (D. E. Hardy). Thirty-two paratypes (the sexes about evenly distributed) from the following localities in the Kokee region on Kauai: same as type; Poomau Val., 3,400 ft., July, 1952 (D. E. Hardy); Halemanu Swamp, August, 1953 (D. E. Hardy); Halemanu Val., August, 1953 (D. E. Hardy); Kalalau Lookout, 4,000 ft., August, 1953 (D. E. Hardy); Nualolo Val., August, 1952, 3,400 ft. (D. E. Hardy); Kokee Stream, August, 1953 (D. E. Hardy); Mohihi River, 3,500 ft., August, 1953 (D. E. Hardy); Waiakaoli Val., 3,700 ft., August, 1953 (D. E. Hardy); and Alakai Swamp, 3,800 ft., July, 1952 (D. E. Hardy).

Type, allotype, and some of the paratypes in the B. P. Bishop Museum; other paratypes deposited in the following collections: U. S. National Museum, Hawaiian Sugar Planters' Association, State Department of Agriculture, British Museum (Natural History), and the University of Hawaii.

This species was collected sweeping the ground litter and low growing vegetation in wet areas.

Subfamily CHRYSOSOMATINAE Becker

Chrysosomatinae Becker, 1921, Abh. Zool.-Bot. Ges. Wien 13:249.

Agonosominae Aldrich, 1905, Smith. Misc. Coll. 46 (1444):283.

Dolichopodinae Lundbeck, in part, 1912, Dipt. Danica 4:18.

Psilopodinae Bezzi, 1928, Dipt. Brach. Fiji Islands, 60.

Sciopodinae Stackelberg, 1930, Dolichopodidae in Lindner, Die Fliegen der Palaearktischen Reg. 29:9.

Members of this subfamily are characterized by having vein M_1 strongly curved upward, arcuate; the apex of cell R_5 is greatly narrowed; also, vein M_2 is well developed (fig. 61a). The vertex is deeply excavated (asilid-like) (fig. 61j); the thorax is broad, the abdomen narrow and rather elongate, and the legs are long

and slender. These are brilliant metallic green or blue species often with dark markings in the wings. They are found on vegetation in the sun.

Two genera occur in Hawaii.

Genus **CHRYSOSOMA** Guérin-Ménéville

Chrysosoma Guérin-Ménéville, 1838, in Duperry, Voy. sur la Corvette Coquille Zool. 2, pl. 20, fig. 5.

Agonosoma Guérin-Ménéville, 1838, Duperry, Voy. sur la Corvette Coquille Zool. 2:293. *Nec Agonosoma* de Laporte, 1832, Ess. Hemipt. in Magasin de Zool. 2:69.

For the long list of synonyms under this genus refer to Becker (1922:114).

Related to *Sciapus* Zeller, but differing by having the third antennal segment cone shaped and the arista apical (fig. 61b) and, also, by having the cerci of the male genitalia developed into rather elongate, slender lobes (fig. 61d, 61g and 61h).

For a key to the Indo-Australian species, refer to becker (1922:124).

Type of genus: *Chrysosoma maculipenne* Guérin-Ménéville.

[It should be noted that there is an error in the labeling of the figure of the type species. Guérin-Ménéville 1838, Zool. Atlas, tab. 20 fig. 5 (not fig. 6) should refer to *maculipenne*.]

KEY TO HAWAIIAN CHRYSOSOMA

1. Antennae yellow; arista without a lamella; legs of both sexes almost or entirely yellow; scutellum with only two bristles 2
 Antennae black, arista with an apical lamella in male (fig. 61b); legs of male predominantly black (at least all coxae and trochanters), also tarsi of female, dark brown to black; four bristles on scutellum; male genitalia as in figure 61d.
 **fraternum** Van Duzee.
2. Thorax and abdomen metallic green or blue in ground color, except for the humeri. Hind tarsus clavate at apex (fig. 61f), front basitarsus flattened and rather short, slightly over half as long as the tibia. Cercus of male short, with a vertically produced prong and four pairs of long hairs at apex (fig. 61g). **palapes** n. sp.

Abdomen in large part yellow; thorax of female largely yellow, in male pleura marked with yellow. Hind tarsus not clavate, front basitarsus long and slender, subequal to tibia. Cercus long and slender (fig. 61h). ----- *pallidicornis* (Grimshaw).

***Chrysosoma fraternum* Van Duzee (fig. 61a-d).**

Chrysosoma fraternum Van Duzee, 1933, Proc. Haw. Ent. Soc. 8:310.

Gnamptopsilopus patellifer Grimshaw, 1901, Fauna Hawaiiensis 3:11, pl. 1, fig. 17. Nec *Psilopus patellifer* Thomson, 1868, Eugenies Resa, Diptera, 507.

Endemic? Hawaii (type locality: Kona); common on all of the main islands and has also been recorded from Midway, Laysan, and Kure Island. It has been known in Hawaii since 1892.

Type in the U. S. National Museum.

Related to *patellifer* (Thomson) but differing in following respects: the lamella at tip of male arista white only at extreme apex (fig. 61c), rather than the lamella being wholly white or nearly so; the bristles of the front femora all pale, not with two black bristles near base below; front tibiae of male without ventral bristles and scutellum with one pair of large and one pair of small bristles, rather than two pairs of large bristles. For a key to the related species see Van Duzee (1933:312) and Bezzi (1928:60).

A brilliant metallic green or blue species, easily recognized by the all-black antennae, by the presence of a lamella at tip of arista, by the all-black ground coloring of body and predominantly black legs of male, and by the differences in wing venation (fig. 61a), genitalia (fig. 61d), and in the chaetotaxy of the legs. The coxae, trochanters, and femora of males are predominantly black; the hind tibiae are brown to black; the other tibiae are yellow with brown to black tips; the hind tarsi are black; and the others are yellow-brown. Vestiture of coxae, trochanters, and femora white. Femora with long hairs along the ventral surface; front femora with two to three yellow-white ventral bristles at basal third. In the female the femora and tibiae are yellow and the ventral hairs of femora are shorter except for the long bristles on the front pair which are equally as well developed as in the male. The male has three small anterodorsal bristles on front and middle femora and no ventral bristles. The female has three large anterodorsal bristles and two large ventral bristles on front and middle tibiae. Two pairs of scutellar bristles are present, the secondary pair is about half the size of the sub-median pair. Wings as in figure 61a, the m crossvein is more S-shaped in the male. Male genitalia as in figure 61d; the forked cercus is very characteristic of this species.

Length of body: 5.0 mm.; wings: 6.0 mm.

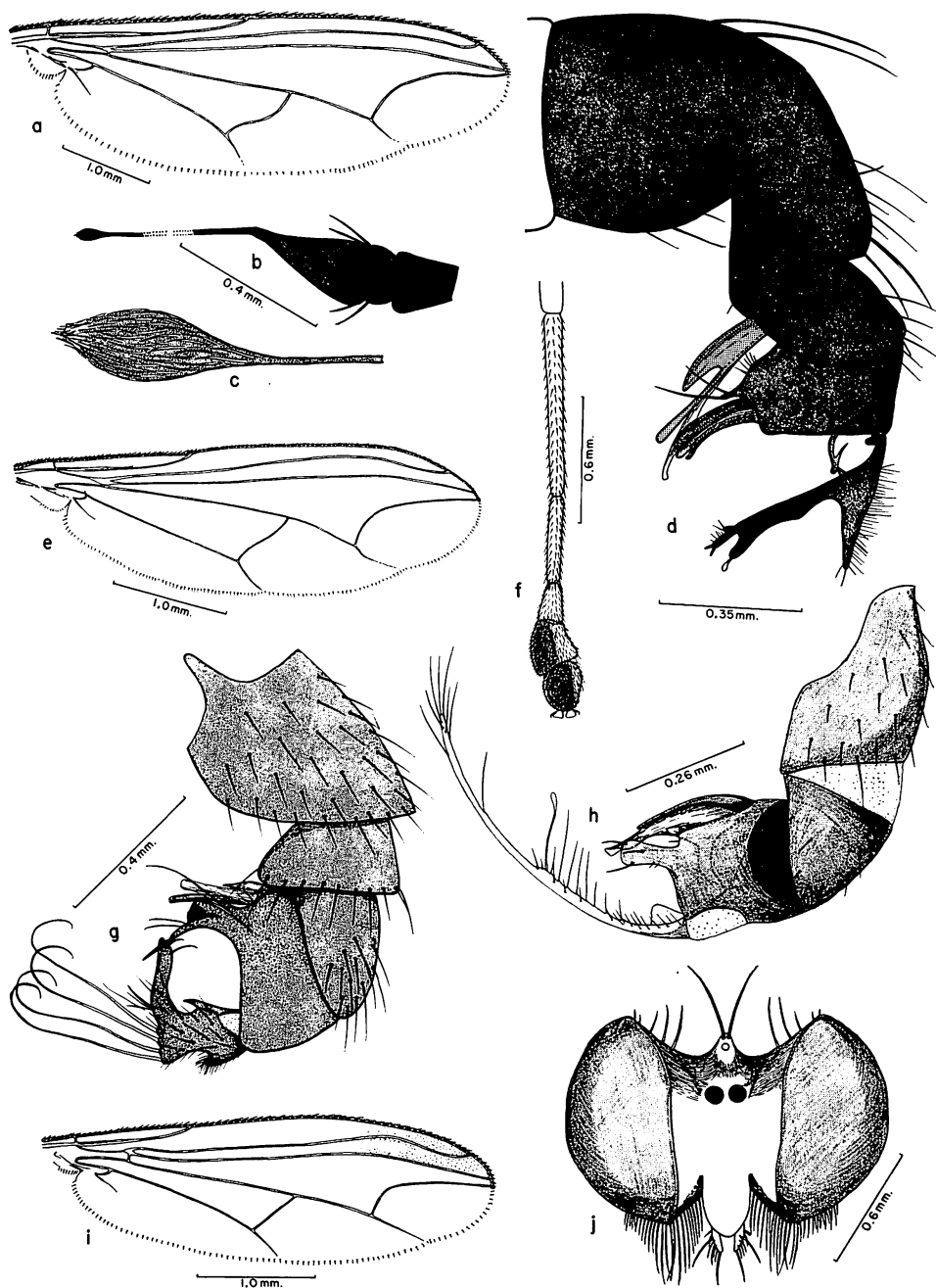


Figure 61—*Chrysosoma fraternum* Van Duzee: a, wing; b, antenna; c, apex of arista; d, male genitalia, lateral view. *C. palapes* n. sp.: e, wing; f, hind tarsus; g, male genitalia, lateral view. *C. pallidicornis* (Grimshaw): h, male genitalia, lateral view; i, wing; j, head, frontal aspect.

Chrysosoma palapes Hardy and Kohn, new species (fig. 61e-g).

Fitting nearest to *C. pallidicornis* (Grimshaw) because of the yellow legs and antenna and the lack of a lamella on the arista; but it is differentiated by the characters given in the above key. In Becker's key to the species of the Indo-Australia region (1922:127) it runs near *C. ovale* Becker, from Ceylon, but the front basitarsus is not so thickened, the arista not enlarged, and the male genitalia are very different.

MALE. *Head:* Front and face densely covered with silvery white pubescence. The front and vertex are blue to blue-green in ground color. The ocellar triangle is green. Mouthparts entirely yellow. Palpi each with two strong black bristles. Antennae yellow, second segment with the ring of black bristles at apex; third segment about as wide as long, tapered to upper apex. Arista brown, about equal in length to the thorax. *Thorax:* Densely gray on the sides, metallic green on the mesonotum, blue on the scutellum, covered with gray pollen but the pollen not obscuring the metallic ground color. On specimens other than the type the coloration of the mesonotum varies from green to blue or purple; also the pleura are metallic green in direct light. Humeri and halteres entirely yellow. Five pairs of dorsocentrals and three pairs of strong acrostichal bristles present. *Legs:* Entirely yellow except for a tinge of brown on middle and hind coxae and for the last four segments of hind tarsi which are brown. Hind tarsi flattened, the last two segments rather spoon-shaped suggesting the palae of the Corixidae (fig. 61f). All bristles and setae on coxae yellow. Front femur with a row of fine, short yellow setae on ventral surface. Front tibia almost devoid of bristles, except for a few at apex; it has only one anterodorsal bristle, situated near basal sixth of segment. The middle tibia has four anterodorsal bristles, one near basal sixth, one near middle, one near apical third, and one preapical. The hind tibia has three anterodorsals, one near basal sixth, one at apical third, and one preapical, and has about three small, poorly differentiated posterodorsals. *Wings:* Entirely hyaline. Venation as in figure 61e. *Abdomen:* Predominantly metallic green to coppery, or blue to purple with a band of gray across the apex of each tergum. Genitalia as in figure 61g. Anterior margin of sixth tergum with a lobe developed on each side. This is not visible *in situ* since it fits beneath the fifth abdominal segment.

Length: body and wings, 4.5 mm.

FEMALE. Similar in most respects to the male except that the hind tarsi are not flattened, the venter of the abdomen is largely yellow and the base of the second tergum is yellow.

Holotype male: Kaimuki, Oahu, November 28, 1921 (O. H. Swezey). Allotype female: Honolulu, December 18, 1922 (O. H. Swezey). Eleven paratypes (eight females, three males): most of the specimens from Honolulu, taken October 14, 1914, November 5, 1936, and April, to November, 1937 (O. H. Swezey and F. X. Williams); one specimen from Nuuanu Val., March 17, 1949 (W. Wong); and

one specimen from Manini Gulch, September 25, 1934 (no collector label).

Type, allotype, and a series of paratypes in the Hawaiian Sugar Planters' Association collection. Remainder of paratypes in the B. P. Bishop Museum, U. S. National Museum, British Museum (Natural History), and the University of Hawaii.

Chrysosoma pallidicornis (Grimshaw) (fig. 61h-j).

Gnamptopsilopus pallidicornis Grimshaw, 1901, Fauna Hawaiiensis 3:12, pl. 1 figs. 20-21.

Chrysosoma fulgidipenne Enderlein, 1912, Zool. Jahrb., Suppl. 15 (1):377.

Chrysosoma pallidicorne Becker, 1922, Capit. Zool. 1 (4):152. Emmendation of *pallidicornis* Grimshaw.

Oahu (type locality: Honolulu, collected in 1896), Hawaii, Kauai, and probably on the other main islands.

Type in the British Museum (Natural History).

Immigrant. Formosa (Becker, 1922:152) and Seychelle Islands (Lamb, 1929:125). Evidently widely distributed, perhaps throughout tropical Asia.

A very distinctive species readily recognized by its yellow antennae, without an apical lamella, by the yellow legs and predominantly yellow abdomen, by the elongate, slender cercus of male, the poorly developed bristles on legs, and by the presence of only one pair of scutellar bristles. Head as in figure 61j. Front coxae with two or three rather strong, yellow dorsal bristles, middle coxae with two bristles, hind with one yellow bristle on outer surface. Femora devoid of bristles or conspicuous hairs. Front tibiae devoid of bristles and each with a small hair on posterior surface near apical one-seventh. Middle tibiae with two small anterodorsal bristles; hind tibiae with about a dozen tiny dorsal bristles and about one-half dozen tiny ventral bristles. The female lacks the sub-apical hair on front tibia but has three rather well-developed anterodorsal bristles and a row of seven or eight tiny ventral bristles on middle tibia. The mesonotum and scutellum are coppery green to blue-green. In the male the halteres, humeri, area of mesonotum immediately above wings, hypopleura, and parts of pteropleura and propleura are yellow; the remainder of pleura are green, covered with gray pollen. In the female, the sides of the mesonotum and all of the pleura are yellow. Wings narrow; venation as in figure 61i. Second costal section about one-half as long as third. Vein R_{2+3} and R_{4+5} rather strongly curved and the m crossvein straight. The wings have a brownish infuscation at upper apex. Abdomen in large part yellow, venter entirely yellow. Second, third, and fourth terga predominantly yellow in male, the sides of terga yellow in female, otherwise green. Male genitalia as in figure 61h. The cerci are long and slender with elongate pile along underside.

This species apparently fits closest to *C. sagax* Becker, from India, but the

yellow third antennal segment, elongate cerci, and other details will differentiate it.

Length of body: 5.5 mm.; wings: 5.0 mm.

Genus **SCIAPUS** Zeller

Sciapus Zeller, 1842, Isis von Oken, 831. Change of name for *Psilopus* Meigen, 1824, Syst. Besch. Zweifl. Ins. 4:35. *Nec Psilopus* Poli, 1795, Test. Sicil. 2:112.

Leptopus Fallén, 1823, Mon. Dolichop. Sueciae (3):23. *Nec Leptopus* Latreille, 1809, Gen. Crust. 4:383.

Sciopus Becker, 1921, Abh. Zool-Bot. Ges. Wien 13:360. Emendation of *Sciapus* Zeller.

For the synonymy under this genus refer to Becker, 1922:196.

Distinguished from *Chrysosoma* by having the third antennal segment as wide as long and the arista dorsal in position. Also the cercus of the male genitalia is broad and rounded, mushroom-shaped (fig. 62d). Our species is also characterized by having two broad brown bands extending transversely across the wing (fig. 62b).

For a key to Indo-Australian species see Becker (1922:212).

Type of genus: *Dolichopus platypterus* Fabricius.

Sciapus connexus (Walker) (fig. 62a-d).

Psilopus connexus Walker, 1835, Ent. Mag. 2:471.

Psilopus pachygyna Macquart, 1848, Dipt. Exot., Suppl. 3:37.

Sciapus pachygyna (Macquart) Bergoth, 1894, Stett. Ent. Zeitng. 55:72.

Sciopus pachygyna (Macquart) Becker, 1922, Capita Zoologica 1 (4):209.

Sciapus connexus (Walker) Hardy, 1930, Australian Zoologist 6 (2):128.

Hawaii (first recorded in 1916).

Immigrant. Recorded in the literature only from Australia and Hawaii. Specimens from Tahiti, Society Islands are in the Parent collection in the Museum National d'histoire Naturelle, and in the B. P. Bishop Museum. The Macquart collection, in Paris, has been studied by the senior author; under *Psilopus pachygyna* are ten specimens. No type is designated. The specimens are labeled as follows: "2/47" (four specimens), "4/46" (five specimens), and "3/47" (one specimen); two specimens (2/47 and 4/46) have an additional label "1153." The label with the species name has something illegible written on it—"Nov." and a second word, "Hiel" or perhaps "Well," plus "Verreaux."

This species is easily differentiated from other Hawaiian dolichopids by the banded wings (fig. 62b). The species is apparently closest to *bifarius* Becker and *triangulifer* Becker, from India, but is distinguished by the rather cylindrical genitalia of the male with large pad-like cerci (fig. 62d); by having just a faint

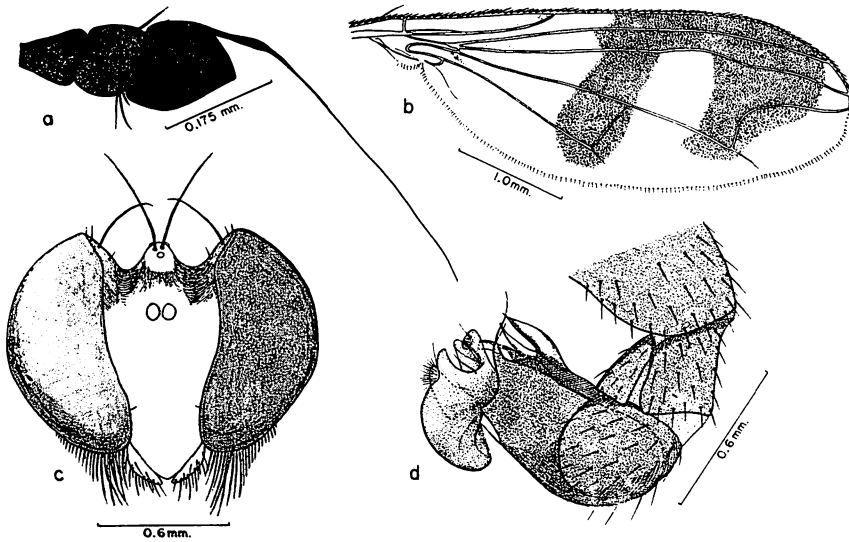


Figure 62—*Sciapus connexus* (Walker) : a, antenna; b, wing; c, frontal aspect of head; d, male genitalia, lateral view.

ring of brown at the apex of the hind tibia; by the m crossvein forming nearly a right angle with vein M_{1+2} ; and by the dull black hind margins of abdominal terga. Antennae black, third segment small, as wide as long, with a dorsal arista (fig. 62a). Vertex blue to blue-green, face silvery pubescent, sides of face slightly converging below (fig. 62c). Thorax and abdomen predominantly blue-green, pleura gray pollinose. Four scutellar bristles, two large and two small. Halteres and legs predominantly yellow; wings as in figure 62b and genitalia as in figure 62d.

Length of body and wings: 5.0 mm.

Subfamily DIAPHORINAE Aldrich

Diaphorinae Aldrich, 1905, Smith. Misc. Coll. 46 (1444) :288.

This seems to be a rather heterogeneous group of genera and we find no particularly satisfactory subfamily characters. In the literature they are distinguished by having the occiput rather concave and the male genitalia cap shaped or hemispherical, usually with strong bristles at the apex (eighth segment) of the male. In the genus *Chrysotus*, because of their small size, these bristles are difficult to discern except under high power. In the genera at hand, especially in the males, the m crossvein is comparatively short, one third or less than the last section of M_{3+4} .

Two genera occur in Hawaii.

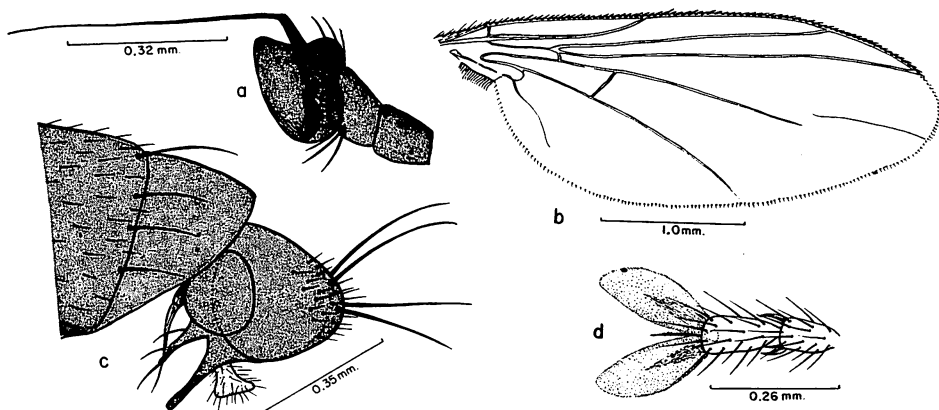


Figure 63—*Asyndetus carcinophilus* Parent: a, antenna; b, wing; c, male genitalia, lateral view; d, apex of tarsus.

Genus *ASYNDETUS* Loew

Asyndetus Loew, 1869, Berl. Ent. Zeitschr. 13:35.

Readily separated from other genera in the Hawaiian fauna by having the costa ending at apex of vein R_{4+5} and M_{1+2} interrupted (fig. 63b). Also by the shape and development of the male genitalia and the presence of a clump of four strong bristles on the eighth segment (fig. 63c).

Only one species is present in Hawaii.

Type of Genus: *Asyndetus ammophilus* Loew.

Asyndetus carcinophilus Parent (fig. 63a-d).

Asyndetus carcinophilus Parent, 1937, Bul. Ann. Soc. Ent. Belg. 77:132.

Immigrant. Oahu (type locality: beach near Blow Hole), Maui, Kauai, Molo-kai, and probably on the sandy beaches of all the islands. It has been associated with crab holes. Two specimens are in the Museum National d'Histoire Naturelle, Paris; one labeled "beach near Blow Hole, Oahu V-22-36 (F. X. Williams)" and one "Hanauma Bay, Oahu VI-26-36 (F. X. Williams)." Neither is labeled type, but the first mentioned specimen is probably the holotype.

A dense gray species with a faint metallic green luster in the ground color, distinguished from all other Hawaiian dolichopodids by the short costa, incomplete vein M_{1+2} ; by the development of the tarsal appendages, the pilosity of the head, and by the small inconspicuous male genitalia with four large apical bristles (fig. 63c).

Front and face silvery white, latter parallel-sided; genae and lower occiput densely white pilose. Antennae short, as wide as long, arista dorsal (fig. 63a). Halteres yellow. Mesonotum with a submetallic bronze stripe down the middle.

Two rows of acrostichal setae present. Two large and two small scutellars present. Propleura haired in the middle. Legs bristly, predominantly greenish black in ground color. Tarsal claws absent, pulvilli very large (fig. 63d). Hind coxae with a strong bristle near base on outer surface. Wings hyaline, second costal section almost as long as third, fourth about one-half as long as second. Vein M_{1+2} interrupted. Crossvein m situated near basal third of wing. Last section of M_{3+4} over five times longer than m (fig. 63b). Male genitalia as in figure 63c.

For an excellent discussion of the habits and life history of this species see Williams (1938:126).

Length of body: 4.0–5.0 mm.; wings: 3.8–4.8 mm.

Genus **CHRYBOTUS** Meigen

Chrysotus Meigen, 1824, Syst. Besch. Zweifl. Ins. 4:40.

Rather tiny species, apparently closer to *Campsicnemus* than to any of the other genera in the Hawaiian fauna. It is characterized by the comparatively short m crossvein and the small inconspicuous genitalia of the male. In *Chrysotus parthenus*, a new species at hand, the m crossvein is one-third or less than the last section of M_{3+4} (fig. 64e); in the females of *pallidipalpus* the m crossvein is slightly less than one-half the length of the last section of M_{3+4} (fig. 64d). Also the wing is comparatively broad and rounded in *Chrysotus*. Cell M_2 is broad compared to that of *Campsicnemus*, measured at a level opposite tip of M_{3+4} , the cell is nearly three times wider than m crossvein; in *Campsicnemus* it is approximately two times wider. The third costal section of *Chrysotus* is comparatively short, being about two times longer than the second section (fig. 64e); in *Campsicnemus* the third is over three times longer than the second. The inconspicuous, largely hidden, male genitalia of *Chrysotus* will further distinguish this from *Campsicnemus*; in the former they are folded under the abdomen and the cerci arise on the venter (fig. 64c), while in the latter the genitalia are not so distinctly folded and the cerci are apical in position.

Apparently only two species, *C. pallidipalpus* Van Duzee and *C. parthenus* n. sp., occur in Hawaii. Five other species have been described as *Chrysotus*, but three (*hawaiiensis* Grimshaw, *saxatilis* Grimshaw, and *spiniger* Grimshaw) are evidently *Eurynogaster* and two (*elegans* Parent and *vulgaris* Van Duzee) are synonyms of *pallidipalpus*.

Type of genus: *Musca nigripes* Fabricius.

Chrysotus pallidipalpus Van Duzee (fig. 64a–d).

Chrysotus pallidipalpus Van Duzee, 1933, Proc. Haw. Ent. Soc. 8:313.

Chrysotus vulgaris Van Duzee, 1933, Proc. Haw. Ent. Soc. 8:313. **New synonymy.**

Chrysotus elegans Parent, 1938, Konowia 16:68.

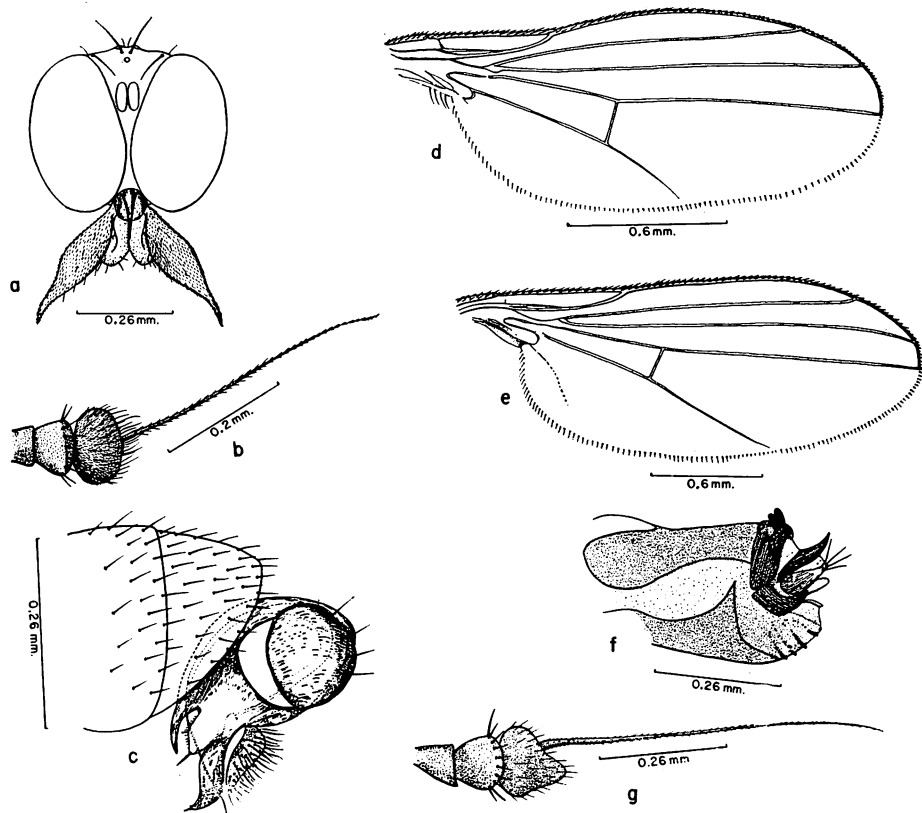


Figure 64—*Chrysotus pallidipalpus* Van Duzee: a, frontal aspect of male head; b, antenna; c, male genitalia, lateral view; d, wing. *C. parthenus* n. sp.: e, wing; f, ovipositor, lateral view; g, antenna.

Endemic? Common in the lowlands on all of the islands (type locality: Honolulu).

Type in the Hawaiian Sugar Planters' Association collection.

C. vulgaris was based upon one specimen (cited as a male) taken on sugar cane at Waialua, Oahu. We have studied this specimen and it is obviously a synonym of *pallidipalpus*. The type is a female specimen and is typical for this species; the differences given by Van Duzee were based entirely on his error in determining the sex of the specimen before him. *C. vulgaris* is mentioned first on the page but we prefer the name *pallidipalpus* since it was based upon a series of specimens of both sexes and is actually a more appropriate name for the species.

This is the smallest species of the family in Hawaii and is one of the most abundant species in the lowlands and up into the mountains to about 2,000 feet elevation. In Becker's key to the Indo-Australian species (1922:90) it runs to

C. graciosus Becker, from India, and to *degener* Frey, from Formosa, but is distinguished by the greatly developed palps of the male (fig. 64a).

Face of male very narrow, eyes nearly touching in middle; female face as wide as both antennae bases. Antennae yellowish to brown; third segment about as wide as long, slightly pointed, apex densely pale pubescent and with a pubescent apical arista (fig. 64b). (Note: Figure is drawn from a relaxed specimen; *in situ* the apical portion is usually shrunken and appears more rounded.) Palpi bright yellow, large, leaf-like in the male, equal in length to the eyes. No prescutellar depression. Mesonotum green, not brightly polished. Pleura gray, halteres yellow. One distinct row of acrosticals present and one pair of scutellar bristles. Legs all yellow. Second costal section of wings slightly over half as long as third and approximately equal in length to the fourth section. Fifth section about three-fifths as long as third. Crossvein m as long as apical portion of vein M_{3+4} (fig. 64d). Abdomen submetallic blue-black. Genitalia of male small, largely hidden, bearing no distinct bristles but with a few erect hairs at apex (fig. 64c).

Length: body, 1.2–1.6 mm.; wings, 1.3–1.7 mm.

***Chrysotus parthenus* Hardy and Kohn, new species (fig. 64e–g).**

This species differs rather strikingly from *C. pallidipalpus* by having a pre-scutellar depression, by lacking acrostichal hairs, by the gray dusted mesonotum, the subapical arista, all-black femora, and by its larger size. It is known only from the females; a large series has been taken in the mountains on all of the main islands.

FEMALE. Head: Front light brown pollinose, faintly bronzed, face gray. Sides of face narrowing gradually to oral margin. Face rather broad with a slight transverse ridge just below antenna and another just below middle; the latter ridge is polished black, the area between these ridges is slightly depressed. Ocellar bristles strong, two-thirds as long as the aristae. A pair of moderately strong, proclinate vertical and a pair of rather small converging postvertical bristles are also present. Antennae black, third segment about as wide as long, arista subapical (fig. 64g). Upper occipital setae black, those of lower portion and on genae are white. Occiput concave on upper portion. **Thorax:** Black in ground color, gray on sides, brownish gray above, only faintly metallic. Five pairs of strong dorsocentrals and no acrostichal hairs present. Two strong bristles plus two tiny setae on scutellum. Prescutellar depression distinct. One small brown bristle present on lower portion of each propleuron. Halteres yellow. **Legs:** Coxae and femora black; trochanters, tibiae and most of tarsi yellow; apical sub-segments of tarsi reddish brown; front and middle coxae with several black bristles above; hind coxae with a rather strong posterior bristle near upper margin. Front and middle femora without bristles, two small postvertical bristles on hind femora. Front tibiae each with a small anterodorsal bristle near basal one-fourth, mid tibiae each with a fairly large anterodorsal and a small posterodorsal near basal one-fourth and a tiny posterodorsal bristle at apical two-thirds. Three strong

bristles around ventral portion of tibia at apex. Hind tibia with three dorsal bristles, one at basal third, one at middle, and one at apex, and one anterodorsal at basal third. *Wings*: Faintly brownish fumose, second costal section slightly over one-half as long as third. Fourth section one and two-thirds wider than fifth. Vein M_{3+4} evanescent before wing margin. Crossvein m one-fourth its length from the wing margin (fig. 64e). *Abdomen*: Faintly metallic green or bronze, dusted with gray. Ovipositor with a series of about six short, thick blunt spines (fig. 64f).

Length: body, 2.2 mm.; wings, 2.4 mm.

MALE. Unknown.

Holotype female: Paliku, Haleakala Crater, Maui, 6,200 feet, June, 1952 (D. E. Hardy). Approximately 300 paratypes from the following localities. Maui: same as type; Holua, Haleakala Crater, June, 1952 (D. E. Hardy and M. Tamashiro); Koolau Gap, Haleakala Crater, 7,000 feet, June, 1952 (D. E. Hardy and M. Tamashiro); Puu Niauniau, Haleakala, April, 1954 (M. Tamashiro); Haleakala, March, 1932 (O. Bryant); Kula Pipeline, March–April, 1932 (O. Bryant); Olinda, March, 1932 (O. Bryant). Oahu: Mt. Kaala, 3,000–4,000 feet, March, 1952 (D. E. Hardy, M. S. Adachi, and M. Tamashiro). Kauai: Poomau Valley, 3,400 feet, July, 1952 (D. E. Hardy); Kokee, 3,600 feet, July, 1952 (D. E. Hardy). Hawaii: Kaula Gulch, Mauna Kea, 7,000 feet, August, 1952 (D. E. Hardy); Puu Kalepa, Mauna Kea, 8,000 feet, October, 1952 (D. E. Hardy); and Puu Kihe, Mauna Kea, 8,000 feet, October, 1952 (D. E. Hardy); Keanakolu Trail, 4,500 feet, October, 1952 (C. P. Hoyt). Lanai: Lanaihale, 3,200 feet, June, 1953 (D. E. Hardy). Molokai: Puu O Kaeha, July, 1952 (D. E. Hardy); Manawainui Valley, July, 1952 (D. E. Hardy); Puu Kolekole, July, 1952 (D. E. Hardy and M. Tamashiro); Hanalilolilo, July, 1952 (M. Tamashiro); Puu Kaeo, July, 1952 (D. E. Hardy and M. Tamashiro); Kawela, 3,700 feet, December, 1925 (O. H. Swezey and E. H. Bryan); Waikolu, December, 1925 (E. H. Bryan); Waikolu Val., 1,400 meters, April–May, 1955 (C. R. Joyce); and Kaunakakai, 2,400 ft., December, 1925 (E. H. Bryan).

Type and a series of paratypes in the B. P. Bishop Museum. Paratypes have been deposited in the U. S. National Museum, British Museum (Natural History), Hawaiian Sugar Planters' Association, State Department of Agriculture, and the University of Hawaii collections.

Subfamily DOLICHOPODINAE Aldrich

Dolichopodinae Aldrich, 1905, Smith. Misc. Coll. 46 (1444):298.

Rather large, robust, bristly species characterized by having the first antennal segment bristled, the middle tibia with five bristles on apex, and male genitalia very large, exposed, with large cerci (fig. 65b).

Only one genus and species in Hawaii.

Genus **DOLICHOPUS** Latreille

Dolichopus Latreille, 1796, *Precis des Caract. Generique des Insectes* 16:159.

Iphis Meigen, 1800, *N. Class. Mouches*, p. 27.

Satyra Meigen, 1803, *Illiger's Mag. f. Insektenk.* 2:272.

Raghe-neura Rondani, 1856, *Dipt. Ital. Prodr.* 1:144.

Rageneura Bigot, 1890, *Ann. Soc. Ent. France* (6) 10:269.

Spathichira Bigot, 1890, *Ann. Soc. Ent. France* (6) 10:278,292.

Spatichira Aldrich, 1905, *Smith. Misc. Coll.* 46 (1444):299.

Comparatively large species, easily recognized by the setulae on the upper portion of the first antennal segment and by the presence of strong dorsal bristles on the hind basitarsi (fig. 65d). The wing venation is also distinctive as shown in figure 65a, with vein M_2 present as a short spur.

Only one species in Hawaii.

Type of genus: *Dolichopus ungu-latus* Linnaeus.

Dolichopus exsul Aldrich (fig. 65a-d).

Dolichopus sp. ? Grimshaw, 1902, *Fauna Hawaiiensis* 3 (2):80.

Dolichopus exsul Aldrich, 1922, *Proc. U. S. Nat. Museum* 61 (25):15.

Dolichopus angustinervis Parent, 1934, *Mem. Soc. Natl. Sci. Nat. Math. Cherbourg* 41:301, *nec* Becker, 1922, *Capit. Zool.* 1:9.

Dolichopus sigmatifer Parent, 1938, *Konowia* 16:67.

Endemic? Common on all the islands; perhaps the most common dolichopodid in wet areas, along streams, pools, etc., throughout the islands. Type locality: Tantalus, Oahu.

Type in the U. S. National Museum.

Readily recognizable among all other Hawaiian Dolichopodidae by the strong dorsal bristles on the hind basitarsi, the wing venation (fig. 65a), and the very large ornate genitalia of male (fig. 65b). This is very close to, and possibly the same as, *D. angustinervis* Becker from Formosa. From the original description we find no satisfactory characters by which *angustinervis* can be separated from *exsul*.

A metallic green species. First two antennal segments yellow, brown to black along upper edges; third segment brown to black except for a yellow area at basal two-fifths on outside surface. Third antennal segment as wide as long, arista densely pubescent, dorsal in position (fig. 65c). Mesonotum strongly bristled, two rows of acrostichals and two strong plus two weak scutellars. Squama fringed with long hairs which range from white to black. Legs predominantly yellow, hind femora slightly brown at apex above, hind tibiae black at apices; tarsi brown to black. Tibiae each with five strong dorsal bristles, hind basitarsi each with two (fig. 65d). Wings faintly gray, venation as in figure 65a. Spur of vein M_1 usually present. Male genitalia approximately equal in length to remain-

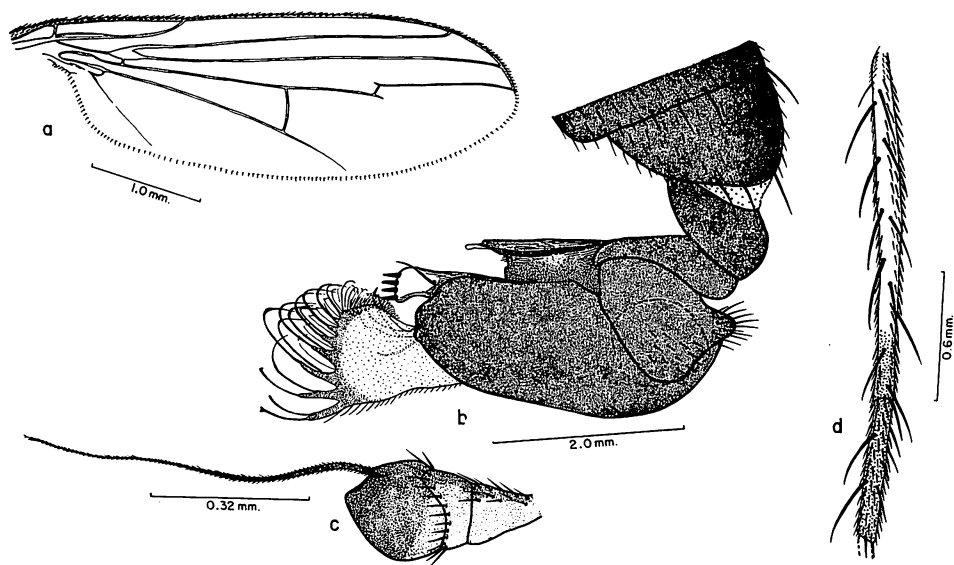


Figure 65—*Dolichopus exsul* Aldrich: a, wing; b, male genitalia, lateral view; c, antenna; d, hind tibia and basitarsus, dorsal view.

der of abdomen. Cerci white except for brown apical margin, very ornate (fig. 65b).

Length: body, 4.0 mm.; wings, 4.4 mm.

This species obviously breeds in a wide variety of aquatic situations from the lowlands well up into the mountains, evidently breeding most abundantly in the algae at edges of streams, pools, waterfalls, or wet banks. Williams (1933:307) says it has been observed feeding upon dead winged forms of the mountain termite, *Neotermes connexus* Snyder. They probably feed commonly upon the midges with which they share similar habitats.

Subfamily HYDROPHORINAE Aldrich

Hydrophorinae Aldrich, 1905, Smith. Misc. Coll. 46 (1444) :296.

Aphrosylinae Aldrich, 1905, Smith. Misc. Coll. 46 (1444) :298.

Differentiated by the dorsal arista, well-developed postvertical bristles, the absence of a prescutellar depression; crossvein m near hind margin of wings and the apical section of M_{3+4} much shorter than m (fig. 66a), male genitalia folded under the apex of abdomen and rather inconspicuous, and acrostichal setae lacking except in *Hydrophorus* Fallén.

Four genera occur in Hawaii; two of these (*Paraliancalus* Parent and *Sigmatineurum* Parent), by lacking acrostical bristles would fit in *Thinophilinae*,

using Brues and Melander's key (1932:304 and 1954:344). We question the value of splitting these into another subfamily. *Uropachys* Parent has been treated in the literature as a Hydrophorinae, but this has a prescutellar depression and we consider it a synonym of *Eurynogaster* Van Duzee (see under that genus).

Genus **HYDROPHORUS** Fallén

Hydrophorus Fallén, 1823, Mon. Dolichop. Sueciae 1:2.

Taechobates Haliday, 1832, Zool. Jour. 5:358.

Orthobates Wahlberg, 1844, Ofver. K. Vet. Akad. Forh. 1:110.

Anorthus Loew, 1850, Ent. Ztg. Stettin 11:117.

Apthrozeta Perris, 1850, Mem. Acad. Sci. Lyon 2:491.

Anoplomerus Rondani, 1856, Dipt. Ital. 1:141. *Nec. Anoplomerus* Dejean, 1835, Cat. Coleop. Ed. 2 (4):326.

Anoplatus Rondani, 1857, Dipt. Ital. 2:14. **Change of name** for *Anoplomerus* Rondani. *Anaplomerus* and *Anaplatus*, as listed by Becker (1917:272) and Vanschuytbroeck (1951:73) are misspellings of Rondani's names.

Parhydrophorus Wheeler, 1896, Ent. News 7:185.

Anorthus Loew, *Orthobates* Wahlberg, and *Taechobates* Haliday have been treated in the literature as synonyms of *Medetera* Fischer; but Coquillett (1910) designated *Hydrophorus jaculus* Fallén as the genotype for all of these so they would have to fall as synonyms of *Hydrophorus* Fallén.

Predominantly gray, submetallic species with eight to ten pairs of dorsocentral bristles, one row of acrosticals, two strong scutellar bristles, three bristles on lower propleura, and fine hairs over the upper propleura. The ocellar, vertical, and postvertical bristles are small. The empodium is large, pulvillus-like. Distinguished from other Hydrophorinae in Hawaii by having acrostical setae, by having the middle portion of propleura haired, by having the third antennal segment short, rounded at apex and with a short, dorsal arista, and also with a small subapical ventral lobe (point) (fig. 66e); also the abdomen of both sexes is extremely short and compact, about equal in length to the thorax; the male genitalia are small and concealed (fig. 66b).

The two Hawaiian species breed in brackish water, chiefly in maritime marshes and brackish water pools, usually near the coast.

Type of genus: *Hydrophorus jaculus* Fallén.

KEY TO HAWAIIAN HYDROPHORUS

1. Wings with brownish infuscation along the veins (fig. 66f). Front femora each with just a few stout black ventral bristles on basal half, arranged in a single row (fig. 66d). Smaller species, body, 2.5–3.0 mm.
 **williamsi** Parent.

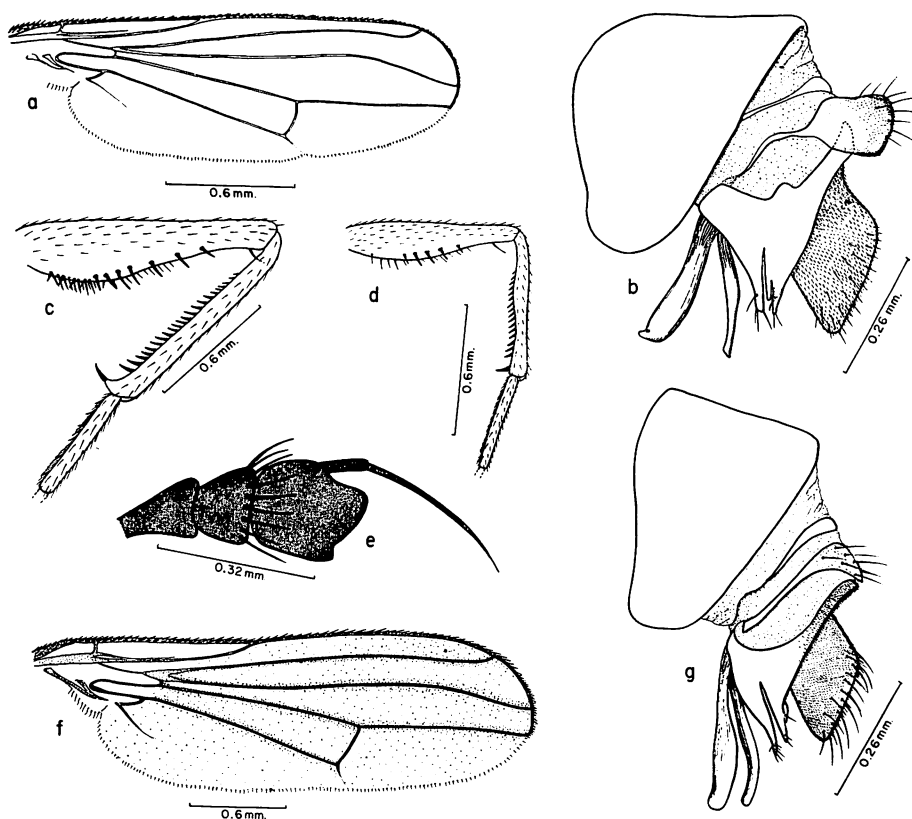


Figure 66—*Hydrophorus pacificus* Van Duzee: a, wing; b, male genitalia, lateral view; c, front femur, tibia, and basitarsus, anterior view. *H. williamsi* Parent: d, front femur, tibia, and basitarsus, anterior view; e, antenna; f, wing; g, male genitalia, lateral view.

Wings entirely hyaline. Front femora densely bristled below on basal half, these bristles arranged in three or more rows (fig. 66c). Larger species, body, 4.0–4.5 mm. *pacificus* Van Duzee.

***Hydrophorus pacificus* Van Duzee (fig. 66a–c).**

Hydrophorus pacificus Van Duzee, 1933, Proc. Haw. Ent. Soc. 8:347, fig. 78.

Endemic? Oahu (type locality: Honouliuli), Maui, Kauai, and Laysan Island. Probably occurs on all the islands.

Type in the Hawaiian Sugar Planters' Association collection.

This has been allied to *H. praecox* Lehmann, which is widespread throughout Europe, Africa, Formosa, and India; *praecox*, however, differs by having the body and leg hairs almost entirely white and the front femora with only one row of ventral spines in the male and two in the female. Specimens of *pacificus* from several localities in Hawaii are in the B. P. Bishop Museum collection determined

praecox by Aldrich. *H. pacificus* differs from *williamsi* by its hyaline wings, larger size, and more densely bristled femora (fig. 66c).

Entirely dark in ground color except for the yellow halteres. Rather densely gray flies with a bronze-green sheen in the ground color, especially on the mesonotum, dorsum of abdomen, and femora. Front femora thickened, with four rows of short thick bristles below. Front tibiae each with a row of rather close-set ventral bristles and a large spine at apex (fig. 66c). Wings hyaline, venation as in figure 66a. Second costal section nearly three-fourths as long as third; fourth nearly three times longer than fifth. Cell R_5 about half as wide at apex as at its broadest point opposite the m crossvein. Abdomen about equal in length to the thorax. Male genitalia inconspicuous, hidden by the folding together of the sides of fifth tergum. The extended genitalia are as in figure 66b.

For an excellent report of the habits and life history of this species see Williams (1939:307–312).

Length: body, 4.0–4.5 mm.; wings, 4.5–5.0 mm.

Hydrophorus williamsi Parent (fig. 66d–g).

Hydrophorus williamsi Parent, 1938, Konowia 16:211–212, figs. 22–23.

Endemic. Hawaii (type locality: Honuapo, Kau), Molokai, Oahu, and probably on other islands.

Type in Parent collection, Museum National d'Histoire Naturelle, Paris. It has not been labeled as such.

Characterized by the infuscations along the wing veins, the smaller size, more sparsely bristled front femora (fig. 66d), and by the male genitalia (fig. 66g).

Like *pacificus* in most respects, differing as pointed out above and as shown in figure 66d, f and g. According to Williams (1939:314), it is not such an adept water skater as *H. pacificus* and prefers more saline waters; occurs more commonly in the tidal mud flats and marshes that are affected by high tide. Its biology has not been studied.

Length: body and wings, 2.5–3.0 mm.

Genus **PARALIANCALUS** Parent

Paraliancalus Parent, 1938, Konowia 16 (3–4):213.

This differs from *Liancalus* Loew by lacking the finger-like development of the ventral edge of the mesopleura, by lacking fine pile on the propleura, and by having only two strong scutellar bristles. It is readily separated from other Hawaiian Hydrophorinae by the presence of a large black bristle on outside surface of hind coxa. The wing venation is very different from that of *Sigmatineurum* Parent, and the body coloration, chaetotaxy, shape of abdomen, and development of male genitalia differ strikingly from *Hydrophorus*.

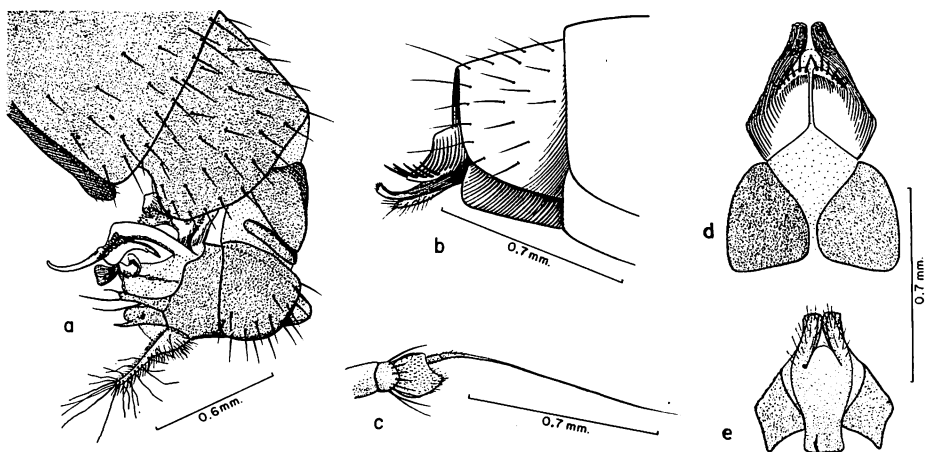


Figure 67—*Paraliancalus metallicus* (Grimshaw): a, male genitalia, lateral view; b, apex of female abdomen, *in situ*; c, antenna; d, ovipositor, dorsal view; e, ovipositor, ventral view.

Only one known species in the islands.

Type of genus: *Liancalus metallicus* Grimshaw.

***Paraliancalus metallicus* (Grimshaw) (fig. 67a–e).**

Liancalus metallicus Grimshaw, 1901, *Fauna Hawaiiensis* 3 (1) : 13.

Endemic. Hawaii (type locality: Olaa), Molokai, Kauai, Maui, and Oahu. Adults occurring on vegetation along streams in the mountains.

Type in the British Museum (Natural History).

Parent (1938:213) said this differs from all of the Palearctic species of *Liancalus* by the bristling of the hind femora, by the preapical bristles on middle and hind femora, by the five pairs of dorsocentral bristles, and two long scutellar bristles. It also lacks the finger-like development of the ventral edge of each mesopleuron, and lacks pile on the propleura such as is found in *Liancalus*.

A large, very brilliant, metallic green, blue-green, or purple species easily recognized by the generic characters given above. Third antennal segment about as wide as long with a dorsal arista (fig. 67c). Ocellar bristles very strong, two-thirds as long as the arista. Vertical bristles lacking, postverticals moderately developed. Occipital bristles black. Five strong dorsocentral and two scutellar bristles present. Three to five bristles present on lower portion of propleura. Squama with a fringe of long black hairs. Wings faintly brown fumose in male, rather dark brown in female. Cell R_5 slightly narrowed apically, m crossvein over two times longer than last section of M_{3+4} and slightly bent outward in middle portion. Male genitalia as in figure 67a; cerci rather slender, with long wavy hairs at apex. Female genitalia with a circlet of about a dozen slender, sharp-pointed, spines (fig. 67b and d) and with a flattened ventral structure (fig. 67e) which is slightly notched in the middle at apex.

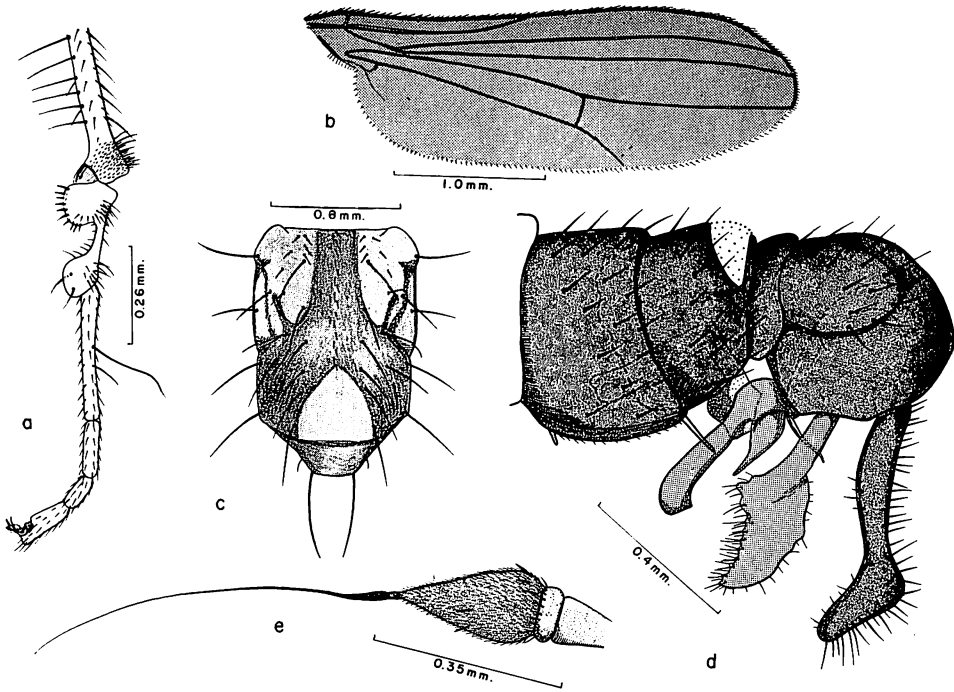


Figure 68—*Paraphrosylus acrosticalis* (Parent): a, front tarsus; b, wing; c, mesonotum; d, male genitalia; e, antenna.

Length: body and wings of male, 6.0 mm. Body of female, 6.5–8.0 mm.; wings, 7.0–8.4 mm.

Genus **PARAPHROSYLUS** Becker

Paraphrosylus Becker, 1921, Abh. Zool.-Bot. Ges. Wien 13 (1) :27.

Members of this genus are known to occur along the Pacific coast of North America and in Hawaii. The characteristics of *Paraphrosylus* are as follows: third antennal segment roughly triangular, flattened laterally with a short acute point at the apex; arista apical; short spinous bristles scattered over the third antennal segment, distinct from the over-all pubescence (fig. 68e); eyes of males not contiguous; six pairs of well-developed, dorsocentral bristles on the mesonotum; acrostichals well developed (except in *direptor* [Wheeler]); the fourth section of the costa (between R_{2+3} and R_{4+5}) distinctly shorter than the fifth (between R_{4+5} and M_{1+2}); male genitalia curved under the ventral side of the abdomen; cerci large and heavily sclerotized (fig. 68d).

Type of genus: *Aphrosylus praedator* Wheeler.

This genus has previously been placed in the subfamily Aphrosylinae. We

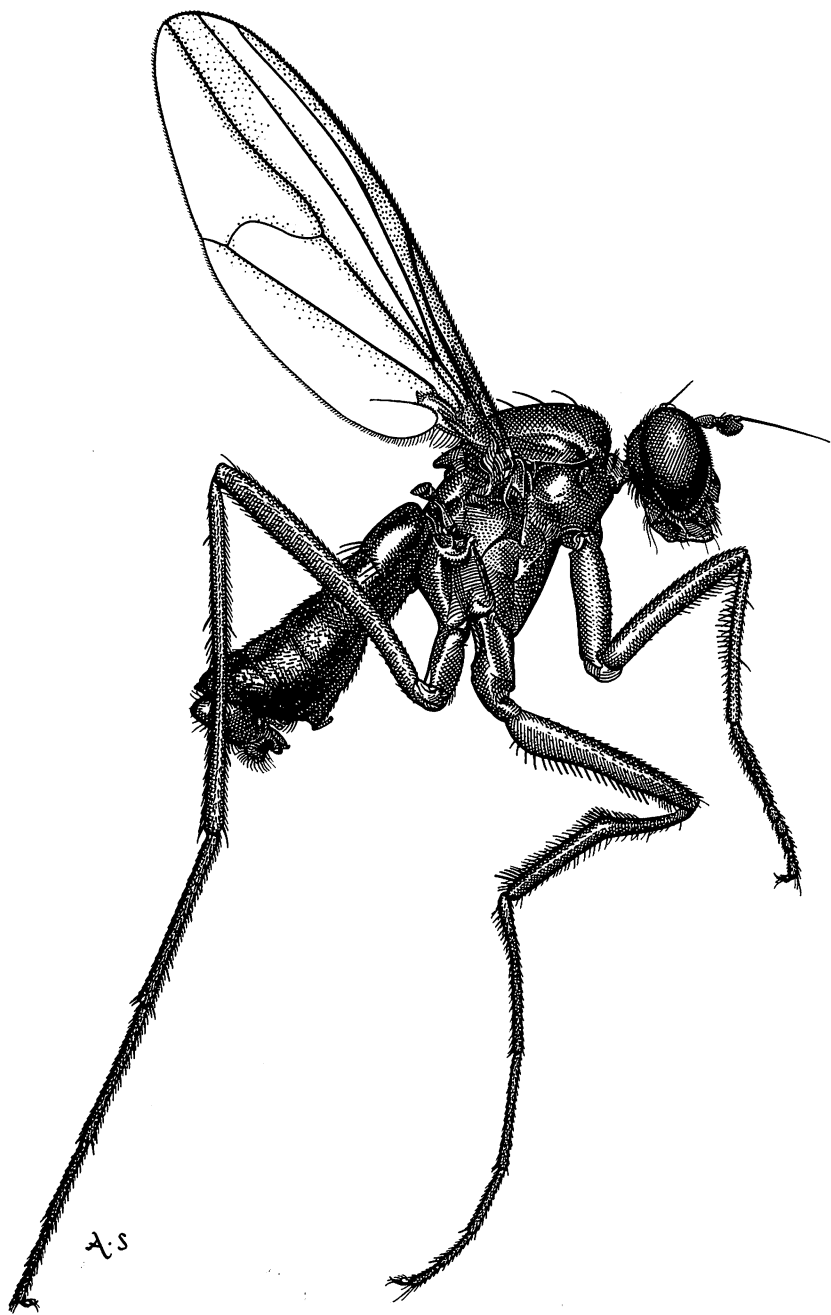


Figure 69—*Sigmatineurum chalybeum* Parent. Type male.

have found no distinctive features which seem to be of subfamily significance and feel that it best to treat the genus under Hydrophorinae.

Paraphrosylus acrosticalis (Parent) (fig. 68a-e).

Paraphrosylus sp. Bryan, 1926, B. P. Bishop Museum Bul. 31:68.

Cymatopus acrosticalis Parent, 1938, Konowia 16:69.

Endemic? Oahu, Hawaii, Maui, Molokai, Nihoa, Necker, French Frigate Shoal, Lisiansky, and Wake Island; (type locality: "Molokai"). This species lives along the seacoast and it is very probably found on all the Hawaiian islands.

P. acrosticalis is distinguished from other *Paraphrosylus* by the development of the front tarsi in the males. Each front tarsus has basal and apical enlargements on the basitarsus and a strong dorsal bristle at the middle of the second segment (fig. 68a). The females as well as the males can be separated from related species by the color pattern of the mesonotum, which is cinereous on the anterior corners and in the prescutellar depression, with a velvety black inverted Y-shaped mark separating these areas (fig. 68c).

Type in the Museum National d'Histoire Naturelle, Paris.

Genus **SIGMATINEURUM** Parent

Sigmatineurum Parent, 1938, Konowia 16:215.

Related to *Paraliancalus* but distinguished by the S-shaped m crossvein in the wing. This is especially developed in the male and often a short spur is present on the lower third of the m crossvein (fig. 70a); this appears to be a rudiment of vein M_2 fused with the crossvein. Also in the males veins R_{2+3} , R_{4+5} , and M_1 are distinctly thickened at about the middle of the veins (fig. 70a). In the female the crossvein is not so strongly bent but more gently S-shaped.

Type of genus: *Sigmatineurum chalybeum* Parent.

Sigmatineurum chalybeum Parent (figs. 69 and 70a-e).

Sigmatineurum chalybeum Parent, 1938, Konowia 16:216-218.

Endemic. Molokai (type locality: Moaula Stream, 2,000 feet) and Maui. Along the streams in the mountains. Apparently a very rare species. Type male evidently in the Parent collection, Museum National d'Histoire Naturelle, Paris. The specimen is not labeled type but contains the exact data reported by Parent.

The species is easily recognized by the generic characters given above. The strongly curved hind crossvein (fig. 69), the chaetotaxy of the middle legs (fig. 70d), and characteristics of the male genitalia (fig. 70e) will distinguish it from all other dolichopodids in Hawaii. This is rather similar in habits and coloration to *Paraliancalus metallicus* (Grimshaw) but is not so large or so highly polished as that species, and it differs in many structural details.

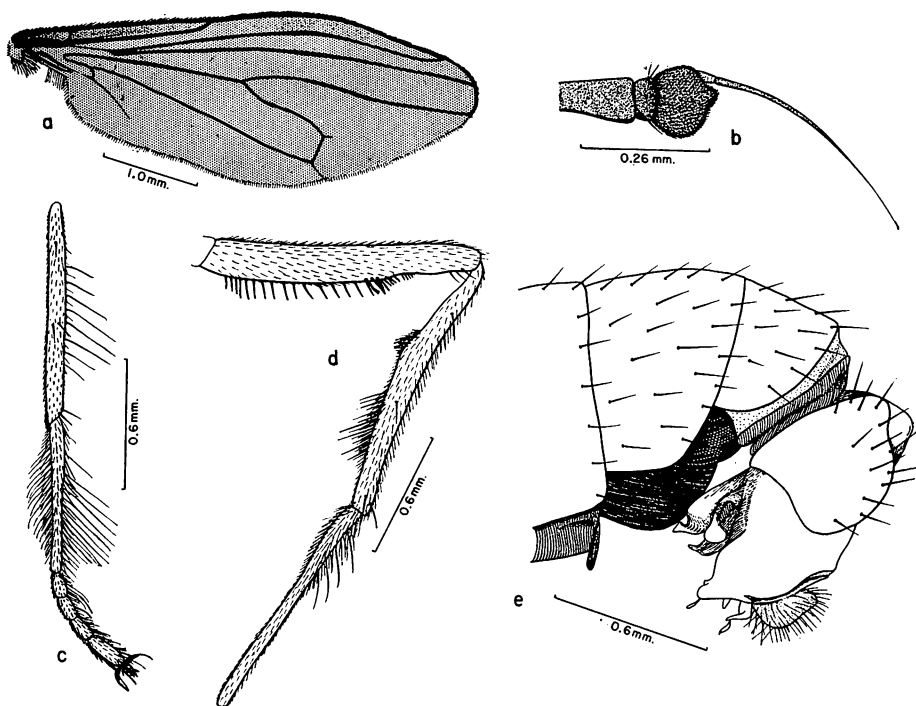


Figure 70—*Sigmatineurum chalybeum* Parent: a, wing; b, antenna; c, front tibia and tarsus, dorsal view; d, middle femur, tibia, and basitarsus, anterior view; e, male genitalia, lateral view.

Entirely brown to black in ground color, submetallic green or bronze. Ocellar bristles brown, rather short and stout, almost as long as antenna (minus arista). Vertical bristles absent, postverticals about one-half as long as ocellars. All occipitals black. Antennae black, first segment rather long, about equal to second plus third; third as wide as long, rounded at apex; arista dorsal, about one-half longer than remainder of antenna (fig. 70b). Five pairs of dorsocentrals present and no acrostichals. One pair of strong and one pair of tiny scutellars present. Propleura bare except for a few fine hairs below. Halteres brown at apices. Hind trochanter without a posterior bristle. Front tibiae each with a row of long thin posteroventral bristles. Front basitarsi each with a row of long posteroventral hairs and also with a row of anteroventral hairs (fig. 70c). Middle femora each with a row of rather stout blunt ventral bristles, these arranged in a small clump at apical third. Middle tibiae each with a clump of ventral bristles at basal third and another at apical third (fig. 70d). The wings are faintly fumose in the males; in this sex the hind crossvein is very strong curved and is apparently made up of vein M_2 plus the m crossvein. Veins R_{2+3} , R_{4+5} , and M_1 are distinctly thickened near the median portions (fig. 70a). In the female the crossvein is more gently sinuate and the above mentioned thickenings are not so apparent on the veins. In both sexes the fourth costal section is shorter than the fifth. Abdomen

largely bronze-green, with a row of rather strong bristles on posterior lateral margins of first and fifth terga (of male). First tergum with a small, opaque, depressed area on anterior median margin. Second tergum with a broad, opaque brown area occupying most of the dorsum; only anterior and lateral margins metallic. Third and fourth terga with a slightly depressed, opaque brown spot on median hind margin, and with the hind margin narrowly opaque. Fifth tergum with a rather broad opaque brown band along hind margin. Male genitalia rather inconspicuous, folded up under the abdomen; when extended the structures are as in figure 70e.

Length: body, 5.5–5.8 mm.; wings, 5.0–5.4 mm.

Subfamily MEDETERINAE

Medeterinae Aldrich, 1905, Smith. Misc. Coll. 46 (1444):295.

These flies are distinguished from members of other subfamilies by having minute postvertical bristles, the occiput concave, prescutellar depression present, and the male genitalia elongate, nearly as long as abdomen with the cerci rather small (fig. 71b). Only one genus is present in Hawaii.

Genus MEDETERA Fischer

Medetera Fischer, 1819, Programme Contenant une Notice sur une Mouche Carnivore, 7. Note: Neave (1940:63) says page 7, Coquillett 1910:565 says page 11, Becker (1922:48) says page 10.

Medeterus Meigen, 1824, Syst. Besch. Eur. Zweifl. Ins. 4:59. Emendation of *Medetera* Fischer.

Medeterium Berthold, 1827, in Latreille, Fam. Nat. Thierr., 497. Change of name for *Medetera* Fischer.

Oligochaetus Mik, 1878, Progr. Akad. Gymn. Wien Dipterol. Untersuchungen, 7.

Predominantly gray, submetallic species characterized by the concave occiput; presence of a prescutellar depression; by having veins R_{4+5} and M_{1+2} convergent apically (fig. 71a); by the very strong ocellar bristles; a well-developed prescutellar depression; two rows of acrostichals; no postvertical bristles; and male genitalia elongate, nearly as long as abdomen (fig. 71b).

The larvae live under bark and prey upon bark beetles and probably other insects.

It is probable that just a single species occurs in the islands. Two are being tentatively recognized here; three have been recorded in the literature in the past: one of these (*hawaiiensis* Van Duzee) is obviously a synonym of *M. atrata* Van Duzee. *Medetera femoralis* Becker was recorded from Hawaii by Bryan

(1931:401), but this was an error. The latter is a New Guinea species which has been tentatively recorded from Fiji.

Nothing is known of the biology of any of the *Medetera* in Hawaii.

Type of genus: *Musca diadema* Linneaus (as *carnivorus* n. sp.).

KEY TO HAWAIIAN MEDETERA

- Legs almost entirely yellow, not more than middle
and hind coxae and apical subsegments of tarsi
brown to black..... *cilifemorata* Van Duzee.
All coxae and basal two-thirds to three-fourths of fem-
ora brown to black..... *atrata* Van Duzee.

Medetera atrata Van Duzee (fig. 71a-b).

Medetera atrata, 1933, Proc. Haw. Ent. Soc. 8:344.

Medetera hawaiiensis Van Duzee, 1933, Proc. Haw. Ent. Soc. 8:343. New synonymy.

Endemic. Oahu (type locality: Honolulu), Hawaii.

Type in Hawaiian Sugar Planters' Association collection.

M. hawaiiensis was based upon one male specimen taken at Nauhi Gulch, Hawaii. It supposedly differed from *atrata* by having the "prothorax with black bristles above front coxae; scutellum with only one pair of bristles; halteres black; first two joints of front tarsi proportioned 23-17; first two joints of posterior tarsi proportioned 15-30." We have examined the type; it has two pairs of scutellar bristles and white propleural bristles, the halteres are discolored; the specimen is badly greased and the poor condition accounts for the differences which Van Duzee saw. We are using the name *atrata* for this species even though *hawaiiensis* has page priority; but since the latter was based upon one poor specimen and the former was based upon specimens of both sexes and is more firmly founded in the literature, it would be preferable to use this name. We also find no significant differences in the comparative lengths of the tarsal segments. It is highly probable that *cilifemorata* is a synonym of *atrata*. We find no structural characters which will separate these. They are separated only on differences in the coloration of the legs and these are somewhat variable; it seems probable that these are just variations of one species. There are no apparent differences in the male genitalia.

Specimens of this and *cilifemorata* are often found in large numbers sitting on fenceposts, on the trunks of trees, and on the sides of houses, other buildings, and other objects.

Predominantly gray with three brownish vittae extending down the mesonotum, faintly metallic in ground color. Four to five pairs of dorsocentrals and two rows of acrostichals present. Two pairs of strong scutellars. The two bristles on

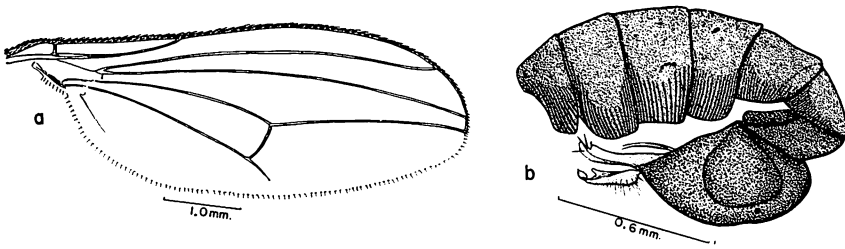


Figure 71—*Medetera atrata* Van Duzee: a, wing; b, male abdomen.

the lower portion of the propleura vary in coloration from pale brown to white. Squamae with long pale hairs on margin. Halteres yellow. Wings, and male genitalia as in figure 71a–b.

Length: body, 2.5 mm.; wings, 3.0 mm.

***Medetera cilifemorata* Van Duzee.**

Medetera cilifemorata Van Duzee, 1933, Proc. Haw. Ent. Soc. 8:344.

Endemic. Oahu (type locality: Honolulu), Hawaii.

Type in Hawaiian Sugar Planters' Association collection.

Very close to, if not the same as, *M. atrata*, apparently differing only by its predominantly yellow legs.

Subfamily RAPHIINAE Aldrich

Raphiinae Aldrich, 1905, Smith. Misc. Coll. 46 (1444) :291.

Members of this group are recognized by the long narrow third antennal segment in the male; with apical arista and (at least in the Hawaiian species) a thumb-like projection of second into the third segment (fig. 72a). The face is narrow and lacks a distinct transverse impression. Only one genus occurs in Hawaii.

Genus SYNTORMON Loew

Syntormon Loew, 1857, N. Beitr. zur Kenntn. Dipt. 5:35.

Plectropus Haliday, 1832, Zool. Jour. 5:353, nec *Plectropus* Kirby 1826, Introd.

Ent. 3:660.

Synarthrus Loew, 1857 N. Beitr. zur Kenntn. Dipt. 5:35.

Differing from other Hawaiian genera by the thumb-like projection of the second antennal segment into the third on inner surface (fig. 72a–b), and by the antennal segment of the male being elongate, produced into a slender point

(fig. 72a). Submetallic species, rather gray with one row of well-developed acrostichals and a prescutellar depression. Wings and genitalia as in figure 72c-d.

Only one species occurs in Hawaii.

Type of genus: *Rhaphium metathesis* Loew.

Syntormon distortitarsis Van Duzee (fig. 72a-d).

Syntormon distortitarsis Van Duzee, 1933, Proc. Haw. Ent. Soc. 8:338.

Endemic. Oahu (type locality: Hering Valley, Tantalus), Kauai, Lanai, Hawaii, and probably on all of the main islands.

Type in the Hawaiian Sugar Planters' Association collection.

This is distinguished from all other Hawaiian dolichopodids by the generic characters given above. According to Van Duzee it differs from other *Syntormon* by the development of the hind tarsi and "it comes nearest to *flexibilis* Becker from Formosa, but that species has the third antennal joint very small, pear shaped, with a subapical arista; first joint of hind tarsi rounded below, widest in the middle, and second joint extending but little beyond base of third joint."

A predominantly submetallic blue-green species, dusted with gray. Face very narrow in male, broad in female. Third antenna of male elongate, drawn out into a long point (fig. 72a); third segment of female about as wide as long (fig. 72b). Thorax submetallic blue to green, dusted with gray. Halteres yellow. Propleura without bristles but with pale hairs in middle and below. A distinct presutural depression present on mesonotum. One row of well-developed acrostichals present. Scutellum with one pair of large and one pair of tiny marginal bristles. Squama with a fringe of long brown hairs. Wing venation as in figure 72c. Legs yellow, second segment of hind tarsus with an apical thumb-like projection. Abdomen metallic green or blue in background, covered with gray pollen, sometimes sides of segments yellow. Male genitalia as in figure 72d.

Length: body and wings, 2.5-3.0 mm.

Nothing is known of the biology of this species. It is often found in close association with *Dolichopus*. It is found sitting around in open sunny places on the vegetation near streams, wet banks, and other wet habitats in the mountains.

Suborder CYCLORRHAPHA Brauer

Cyclorhapha Brauer, 1880, Zweifl. Kais. Mus., Wien, p. 51.

The members of this suborder are the most specialized of the Diptera and are typically short, stout-bodied flies with short three-segmented antennae bearing a dorsal arista, and usually the head and thorax are distinctly bristled. The pupa is enclosed in a puparium and the adult fly escapes through a more or less circular opening made by pushing off the anterior end. The adults of the Series Schizophora force off this cap by inflating a balloon-like structure, the ptilinum,

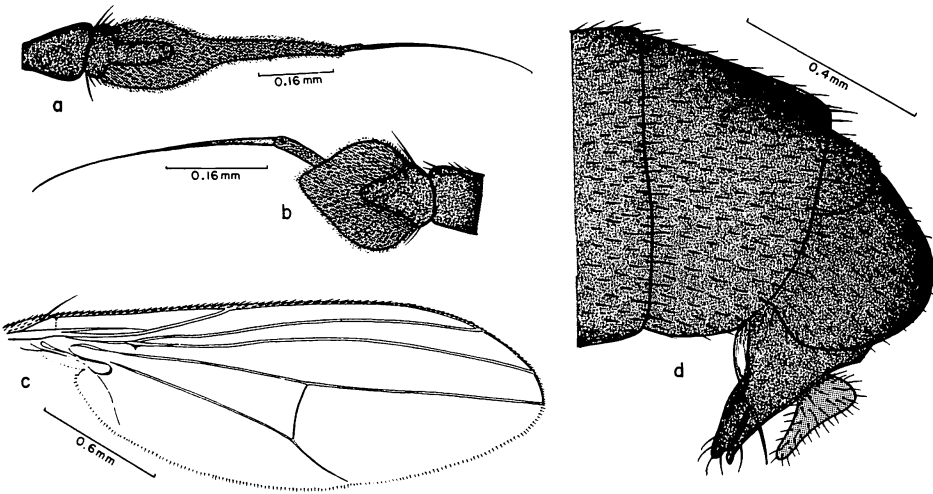


Figure 72—*Syntormon distortitarsis* Van Duzee: a, male antenna; b, female antenna; c, wing; d, male genitalia, lateral view.

which is extruded from the front of the face. After emergence the sac is withdrawn into the head, but the adults are well characterized by the presence of the ptilinal suture which extends just above the antennae and down the sides of the face. The members of the Series *Aschiza* do not possess a ptilinum or ptilinal suture. Only the latter group is treated in this volume.

Series *ASCHIZA* Becher

Aschiza Becher, 1882. Wien. Ent. Zeitung 1:53.

These flies are differentiated from other Cyclorrhapha by lacking a ptilinal suture. Only four families of Hawaiian flies belong in this Series: Lonchopteridae, Phoridae, Pipunculidae, and Syrphidae. Two of these, the Phoridae and Pipunculidae, contain endemic species.

Family LONCHOPTERIDAE Macquart The Pointed- or Spear-winged Flies

Lonchopterinae Macquart, 1835, Hist. Nat. des Ins. Dipt. 2:13.

Lonchopterinae Rondani, 1841, Nuov. Ann. Sci. Nat. (Bologna) 6:280.

Lonchopteridae Walker, 1851, Insecta Brit. 1:221.

Lonchopteridae Rondani, 1856, Dipt. Ital. 1:28.

Musidoridae Kertész, 1910, Cat. Dipt. 6:322.

For other synonymy see Handlirsch, in Schröder (1925:1000).

The family name is from the Greek "*lonche*," a lance or spearhead, plus "*pteron*," wing.

This is a small family of about twenty known species for the entire world. Members are widespread over Europe, Africa (south of the Zambezi), Asia, and North and South America. One of the species which is known to be widely distributed over Europe and North and South America also occurs in Hawaii, New Zealand, and possibly other areas of the Pacific.

Lonchopterids are moderately small, yellow to brown or gray-black in color, and are readily recognized by their pointed, lance-shaped wings with crossveins present only in the basal part of the wings, and by the characteristic venation as shown in figure 73b. Most of the veins are setulose above, only veins R_{2+3} , Sc and the bases of R and M are bare. Vein R_1 ends just slightly beyond the tip of Sc at about the basal fourth of the wing; vein R_{2+3} ends just before the wing apex and R_{4+5} ends at the apex; R_{2+3} and R_{4+5} converge at their apices narrowing cell R_3 at the wing tip. The anal vein usually fuses with vein Cu_1 and cell Cu usually has a long petiole at its apex (fig. 73b). The head is strongly bristled, one pair each of well-developed frontal, outer vertical, inner vertical, ocellar, and upper occipital bristles are present, besides a row of strong bristles along oral margin, and a row of occipital cilia. The antennae are short; the third segment is semicircular with a large apical arista (fig. 73c). Four pairs of dorso-central bristles are present on the thorax; on the species represented in Hawaii the first and fourth pairs are tiny compared to the other bristles. The scutellum has two large marginal bristles.

The lonchopterids of the Palaearctic region have been monographed by Czerny (1934); the Nearctic species have been treated by Curran (1934b); and the Japanese species by Okada (1935).

The adults are found in vegetation, especially grasses, in moist habitats. The larvae are evidently predominantly scavengers and are found in association with decaying plant materials. According to Lindner (1949:153) some species live in the burrows of bark beetles, apparently preying upon the beetle larvae; some live in the excrement of plant eating mammals; one species lives in red beets which are infested with beet nematodes, and one species is known to be a pest of figs.

The larvae are flat and broad, rounded on the sides, and about two times longer than wide. The body is ten-segmented; the head and prothorax and the metathorax and the first abdominal segment are fused. The posterior spiracles are widely separated. The apex of the body has a pair of strong bristle-like appendages; the head and thoracic region also have a pair of bristles on each side. The larvae go through a prepupal stage in the last larval skin before transforming into a true pupa. The adult escapes through a T-shaped slit in the pupal case.

J. C. H. de Meijere (1900) gives an excellent account of the larvae of *Lonchoptera*.

Genus **LONCHOPTERA** Meigen

Musidora Meigen, 1800, Nouv. Class. p. 30. Rejected name.

Lonchoptera Meigen, 1803, Illiger's Mag. 2:272.

Dipsa Fallén, 1810, Spec. Ent. Meth. Exh. p. 20.

Lonchopteryx Stephens, 1829, Nom. Brit. Ins. p. 63.

Only one genus is known; it is recognized by the family characters given above. One species occurs in Hawaii.

Type of genus: *Lonchoptera lutea* Panzer, the first species, by designation of Curtis, 1839, Brit. Ent., p. 761.

Lonchoptera furcata (Fallén) (fig. 73a-c).

Dipsa furcata Fallén, 1823, Dipt. Suec., Phytom. p. 1.

Lonchoptera dubia Curran, 1934, Amer. Mus. Nov. 696:5. New synonymy.

For other synonymy refer to Czerny (1934:8).

Kauai, Hawaii, Maui, and Molokai.

Immigrant. Widespread throughout Europe, Asia, North and South America, New Zealand, and Hawaii.

The cotype series is in the Swedish Museum of Natural History, Stockholm.

This species is differentiated from other *Lonchoptera* by the bristling of the legs. The middle tibia has two rather strong dorsal bristles and one small posterodorsal bristle; the latter is situated nearly in line with, or is in line with, the uppermost dorsal bristle and is about half the size of that bristle (fig. 73a). The middle tibia also has one weak ventral bristle at apical third of segment. The front tibia has one small posterodorsal bristle at basal third of segment and two weak dorsal bristles; the posterodorsal bristle is absent on the front tibia in the male. The predominantly black antenna, with only the basal segment yellow, will also help to differentiate this species.

L. furcata is an extremely variable species, which accounts for the numerous synonyms assigned to this name. I have compared specimens from various of the Hawaiian Islands with specimens from the mainland of the United States and from continental Europe and I believe it is obvious that our species in Hawaii is *furcata* and that *dubia* Curran is a synonym. Dr. W. W. Wirth, U. S. National Museum, has also compared materials from the above sources and said that he has been unable to find any differences in them. He also stated, in correspondence, "We also have about 50 specimens from South America which also fall here, also 25 from New Zealand from the series Harrison reported as *dubia*" (Harrison, 1950:449).

I sent specimens from the mainland of the United States and Hawaii to the late Dr. Martin Aczél, Tucuman, Argentina, and he reported that without doubt *dubia* Curran is a synonym of *furcata* Fallén.

E. H. Bryan, Jr. (1936:153-155) gave an excellent discussion of the *furcata*

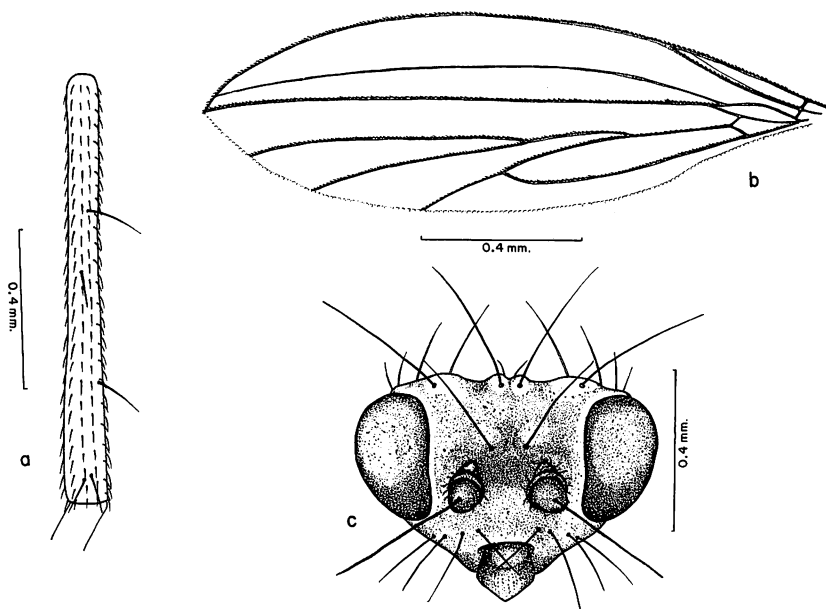


Figure 73—*Lonchoptera furcata* (Fallén): a, middle tibia; b, wing; c, head, front view.

vs. *dubia* question and concluded that "unless there are some more distinctive characters for Curran's *L. dubia* than have been pointed out," that name also must be added to the list [of synonyms under *furcata* Fallén]. In the original description of *dubia*, Curran (1934:7) states that "*L. dubia* cannot be *furcata* because that species is described as having the bristles of the back of the head wholly yellow, whereas in *dubia* some of the occipital cilia are black and it is only rarely that the dark bristles are reduced to one or two in number. In addition, the fact that males are entirely unknown in *dubia* is strong grounds for believing that our species cannot possibly be the same as the European." In the Hawaiian specimens the inner vertical bristle and the upper two occipital cilia are usually yellow, with the next three to four (median) ocellars brown to black, and the lower ones yellow. The females which I have studied from Europe, were like this: the single male specimen (also from Europe) which I have seen, has the inner vertical and upper occipitals dark colored. I do not believe that the coloration of the occipital cilia is a constant character and do not consider Curran's key (1934a: 233; and 1934b) satisfactory for separating the North American *Lonchoptera*. It should be pointed out that the first part of couplet 1 of this key, "Bristles of the vertex [inner vertical bristle] and the orbital [occipital] cilia wholly yellowish," should run to "3," not to "4."

Lundbeck (1916:14) gave a detailed description of *furcata* and said "postocular bristles yellow, often some of the upper black." Czerny (1934:9) says, "Vti [inner vertical], occe [upper occipital, occipalis exterior] und cil [postocular or postoccipital cilia] gelb, einige der oberen cil fast immer in gewisser Richtung

schwarz." J. C. H. de Meijere (1906:73) in his description of *furcata* made the same statement.

Regarding Curran's statement that the absence of males is significant for setting off *dubia*, it is apparent that *L. furcata* reproduces entirely by parthenogenesis (one of the few known cases in higher Diptera) and it is very doubtful that bisexual reproduction ever occurs in this species. In Europe, and probably other areas, males are rarely taken; apparently the ratio of males to females is about 1:5,000+. Dr. Aczél (in correspondence) has indicated that the male individuals which have been taken "were imperfect and sterile, representing only a form of atavism for the parthenogenetic species." Only females have been collected in the Hawaiian Islands, New Zealand, and, apparently, in North and South America.

I also sent specimens from Hawaii to Dr. W. Hennig, Deutsches Entomologisches Institut, for comparison with European specimens of *furcata*, and he wrote that he was not sure that the specimens from Hawaii were *furcata* Fallén. He said, "Die Posterodorsalborste der t2 steht bei dem Tier aus Hawaii ein wenig höher als die obere Anterodorsalborste, während sie bei allen europäischen Exemplaren in unserer Sammlung in genau gleicher Höhe oder sogar etwas tiefer steht." I find the posterodorsal bristle to be rather variable in position and would consider it of no importance in placing the Hawaiian specimens. In a long series of specimens the posterodorsal bristle of the middle tibia is normally just slightly beyond a level with the proximal dorsal bristle, in about the same position as it is in the European specimens which I have studied. In some specimens the posterodorsal is in line with the proximal dorsal bristle and in others it is above it. Aczél (1940:111) indicates that the position of the posterodorsal bristle is not always constant in *furcata*.

Four varieties of *furcata* are recognized in Europe; these are based upon color differences which seem rather trivial. Most of our specimens seem to fit near the variety *lacustris* Zetterstedt by having the thorax dark colored with a narrow yellow vitta down each dorsocentral area; or to *civarella* Zetterstedt by having the thorax mostly brown to black in ground color and covered with gray pollen. The paler specimens seem to best fit the variety *rivalis* Meigen by having the occiput and the abdomen mostly dark colored and by having a rather broad median vitta down the mesonotum. I think without doubt that specimens could also be found here which would fit the typical variety *furcata* (Fallén) by having the occiput and abdomen mostly yellow and a rather narrow median vitta down the mesonotum. Curran, in the original description of *dubia*, describes light and dark color forms, and on the mainland of the United States there is some evidence that rather distinct seasonal forms do occur.

Malloch (1932:283) in recording *L. furcata* from Chile said, "a peculiar character of this species is the very great reduction in length and strength of the prescutellar pair of dorso-central bristles, these being very much shorter than the pair in front of them or the postalar pair." On the Hawaiian specimens the prescutellar bristles are tiny compared to the second and third pairs of dorso-

centrals; the first pair (prescutellar) is about equal in development to the fourth pair (anterior). I have not had an opportunity to check other species for this character but I doubt that it is peculiar to *furcata*.

Length: body, 2.0–2.7 mm.; wings, 3.0–3.3 mm.

This species was first recorded in Hawaii by Bryan (1924:347) from specimens collected near Kilauea, Hawaii, in August, 1922, by W. M. Giffard. It is rather common in grassy areas at higher elevations on all of the main islands except Oahu and Lanai (to date there are no records for these islands) and has been collected up to an elevation of 13,007 feet along the edge of Lake Waiau, Mauna Kea, Hawaii.

An interesting and most significant paper on evolution of parthenogenesis in this species (as *Lonchoptera dubia* Curran) has been published by Stalker (1956).

Family PHORIDAE Curtis Humpbacked Flies

Phoridae Curtis, 1833, Brit. Ent., pl. 437.

Phorites Newman, 1834, Ent. Mag. 2:396.

Phoridae Haliday, 1851, in Walker's Ins. Brit. Dipt. 1:9.

For other synonymy refer to Handlirsch, in Schröder (1925:1000–1001).

The name *Phoridae* is taken from the Greek "*Phora*," a quick motion; apparently referring to the very active, erratic way in which these flies run about.

Small, usually dark-colored, often yellowish flies with the thorax arched, giving them a humpbacked appearance. They are very readily recognized by the characteristic antennae, with only one clearly visible segment (fig. 77a), and by the specialized wing venation (fig. 80b).

The head is small and the eyes are mostly widely separated (except in the males of *Phora* Latreille and *Trineurocephala* Schmitz); the front usually has three transverse rows of four strong bristles and one or two pairs of bristles on lower portion. Following Schmitz's terminology for the head bristles (1938:16), the three pairs of lateral bristles which are usually present are referred to as the anterior, median, and posterior laterals. The upper lateral bristle is situated on the vertex and is often referred to as the inner vertical bristle. One or two pairs of bristles situated near the anterior median margin of the front above the antennae are referred to as the supra-antennal or post-antennal bristles. A pair immediately behind these, sometimes to the sides, is referred to as the antials. A pair of ocellar and a pair of preocellar bristles are also present and sometimes a pair of interfrontals is situated near the median portion of the front (e.g., in *Pseudacteon* Coquillett). The median laterals and the preocellars, and the anterior laterals and the antials are arranged in transverse rows across the front in most of the Hawaiian species (fig. 77a). The arrangement of these frontal bristles is very important in differentiating genera and species. The frontal bristles

are rather poorly developed in the genus *Chonocephalus* Wandolleck. The antennae of the phorids are actually three-segmented but the basal segments are rudimentary and are hidden by the rather large and conspicuous third segment. The third is rounded, oblong, or pointed with an apical, subapical, or dorsal arista which is very seldom wanting (e.g., in males of *Dahliphora* Schmitz). The thorax is large, densely hairy on the mesonotum, and with just one pair of dorso-central bristles (in the Hawaiian species) situated near the hind margin. The propleura are setose and the mesopleura are entirely bare (aside from *Endonepenthia* Schmitz). Wings are well developed in the Hawaiian species, except in the females of *Puliciphora* Dahl and *Chonocephalus* Wandolleck. The wings are folded over the abdomen when at rest and the venation is reduced. The costa is short, usually ending near the middle of the wing; the costal margin is densely setose. The subcosta is rudimentary, scarcely developed beyond the humeral crossvein, or it is fused with the base of vein R_1 . The radial veins are stout and the R_s is simple, or it is forked near the apex; the thickened veins end near the middle of the wing. Three median veins are present; these radiate off the radial sector. Cu_1 and the anal vein are apparently fused into a single vein near the hind margin of the wing (fig. 80b). The legs are well developed, the coxae and femora are broadened. The bristling of the legs is very important taxonomically. In *Conicera* (*Tritoconicera*) *hawaiiensis* Colyer the middle femur has a very characteristic sense organ near the apex on the posterior surface (fig. 74c), and *Diploneura* (*Dohrniphora*) *cornuta* (Bigot) has a characteristic clump of short, posteroventral sensory setae near the base of the hind femur (fig. 75d). The male genitalia are distinctive; the tenth segment is prolonged into an anal tube (fig. 80c). For more complete morphological details refer to Schmitz (1938:1-49).

The larvae of Phoridae are fusiform or short and broad and usually possess conspicuous projections around the margins, especially on the posterior margins. These projections are often plumose, and in some species each tergum has a row of tubercles near the hind margin. The head is small and inconspicuous and bears two sensory papillae and two very small, nearly parallel mouth hooks which arise from a rather well-developed cephalopharyngeal skeleton; the mouth hooks are sometimes entirely lacking. The prothoracic spiracles are small, inconspicuous, and usually borne on small tubercles. The posterior spiracles are confluent and are situated on well-developed cone-shaped projections. The pupae are usually covered with numerous strong, pointed projections, especially around the hind margin, and the respiratory horns are usually long and slender; in *Chonocephalus* Wandolleck they are divided in two on the distal half. For more information on immature stages refer to Schmitz (1938:49-64; 1941:65-75).

We have very little information concerning the habits of the Hawaiian species; they may all be saprophytic, although some are probably fungivores. These flies are found breeding in, and associated with, a wide variety of dead organic materials. Some species seem to show definite preference for dead snails, others for decaying vegetation, or other types of humus. In other regions some of these flies are parasites on various arthropods and possibly other animals. Some species

have been associated with live snails in different parts of the world, and one (*Pericyclopera javicola* Beyer) has been reported as a parasite of the giant African snail (*Achatina fulica* Bowdich) in Java. It is probable, however, that all of the species which are associated with live snails live in the slime around the base of the foot. In other areas many species of phorids are associated with ants and termites, living asinquilines in their nests; this association has not been reported in Hawaii. In other parts of the world many species are known to be associated with fungi and some cause severe damage to cultivated mushrooms. For information on fungicolous species refer to the excellent works of Colyer (1952, 1954b, 1956) and Schmitz (1948). One species, *Conicera* (*Tritoconicera*) *tibialis* Schmitz, in Europe, has gained considerable notoriety as the "coffin fly" because of its apparent attraction to buried bodies, human and otherwise. The adult flies apparently burrow through the soil until they reach the corpse and they may possibly find their way into the coffin for oviposition directly upon the body or may oviposit in cracks through which the larvae may penetrate the coffin. According to Leclercq (1949), corpses become infested about a year after interment. Schmitz (1928; 1938:2-4; 1952:280-300) has made a thorough investigation of the phorids which occur in coffins, and Colyer (1954a, 1954c) has given an excellent discussion of this interesting subject.

Some species, i.e., *Megaselia* (M.) *scalaris* (Loew) and *M. rufipes* (Meigen) (both are widespread over much of the world but only the former species is present in Hawaii), are very strongly attracted to wounds and sores, especially after gangrene has set in. The females may oviposit on the wounds and the larvae may develop in the tissue, probably feeding as saprophytes. Numerous cases of wound myiasis have been reported in the literature (see Patton 1922). The senior author of this volume (Hardy 1951) has published a report of wound myiasis involving *M. scalaris* (Loew) where it appeared, from the medical report, that the flies had infested the thoracic cavity of a man in Honolulu. According to the case history a sample of purulent fluid containing the fly maggots was aspirated from the thoracic cavity of a Filipino man. About a year before, the man had suffered a chest wound which did not heal properly (apparently a stab wound, from information received after the published report). When he was subsequently hospitalized and a thoracentesis was performed, two quarts of very purulent fluid were aspirated from his chest. No evidence of contamination of the aspirant could be proved and no maggots could be demonstrated after the wound had been cleaned. It was concluded that the myiasis probably had been around the site of the wound rather than in the body cavity. At least one case has been reported in the literature (Patton 1922) involving *M. scalaris* in ophthalmic myiasis, and apparently authentic cases of intestinal myiasis, contracted by eating contaminated foods and involving both of the above mentioned species, have been reported in the literature. In some cases the flies have evidently matured and reproduced several generations in the digestive tract (see James 1947: 162).

The adult phorids are commonly found on windows, on vegetation, and

around humus of all sorts. Specimens of *Chonocephalus* are attracted to lights; often large numbers are taken in light traps.

This family consists of over seventeen hundred species in 166 genera and 20 subgenera and is still very poorly known over much of the world. Our knowledge concerning these flies is based in great part upon the writings of three outstanding workers: Dr. H. Schmitz, in Europe; Dr. C. T. Brues in North America; and Dr. T. Borgmeier in South America. For over forty years, the late Dr. Hermann Schmitz (Bad Godesberg, Germany) was the leading authority on these flies. C. N. Colyer (London, England) and the junior author, E. Beyer, (Bad Godesberg, Germany), the most recent students of this group, are following the modern concepts of Schmitz and are making many valuable contributions to the literature.

Schmitz divided the family into two supersubfamilies: Hermaphroditae and Chorigenae. The former is not represented in Hawaii, and consists of only one subfamily (Termitoxeniinae); the Chorigenae contains five subfamilies: Alamiirinae (monogeneric), Aenigmatiinae (10 genera), Thaumatoxeninae (monogeneric), Phorinae (35 genera and 6 subgenera), and Metopininae. This latter subfamily is again divided into two tribes: Beckerinini (7 genera) and Metopinini (97 genera and 12 subgenera). Only the Phorinae and Metopinini are represented in the Hawaiian fauna. The Phorinae contains two genera and one subgenus, the Metopinini contains four genera and one subgenus. To date 17 named species plus two unnamed species are known from Hawaii; some of these have obviously been introduced, but a few species which occur in the mountainous interior of the islands are probably endemic.

In keeping with the standard terminology used for the phorids, a slightly different interpretation is used here for the costal sections than is used by the senior author in other families of Diptera. The first section of the costa refers to that portion from the wing base to the apex of vein R_1 rather than interpreting this section as being divided into two sections by the humeral crossvein. The costal index is the length of that section of the costa from the humeral crossvein to the end of vein R_1 compared to the length of the section from tip of R_1 to the apex of vein R_{2+3} .

KEY TO KNOWN GENERA OF HAWAIIAN PHORIDAE

1. Wings absent (females).....2
 Wings well developed.....3
2. Head strongly produced; supra-antennals absent.....
 **Chonocephalus** Wandolleck.
 Head not flattened or produced; supra-antennal
 bristles present.....**Puliciphora** Dahl.
3. Middle tibia with a pair of strong bristles at basal
 fourth; supra-antennal bristles directed backward;

- mesopleuron not divided. Phorinae.....4
 Middle tibia lacking bristles; supra-antennal bristles
 directed forward or lacking; mesopleuron divided
 by a vertical suture. Metopininae.....5
4. Radial sector simple, not forked. Male antenna with
 third segment produced, cone-shaped.....**Conicera** Meigen.
 Radial sector forked. Male antenna round.....
 **Diplonevra** Lioy.
5. Radial sector simple, not branched.....6
 Radial sector forked.....**Megaselia** Rondani.
6. Vein M_2 bent downward and M_{3+4} bent upward so
 cell M_2 is hourglass-shaped; anterolateral bristle
 lacking.....**Metopina** Macquart.
 Veins M_2 and M_{3+4} straight or but slightly bent, not
 strongly curved together.....7
7. Vein R_1 incomplete, not reaching wing margin; sub-
 costal cell not distinct. Base of M_1 lacking. Supra-
 antennals absent..... **Chonocephalus** Wandolleck.
 Vein R_1 complete; base of M_1 present; supra-antennal
 bristles present **Puliciphora** Dahl.

Subfamily PHORINAE Rondani

Phorina Rondani, 1856, Dipt. Ital. Prodr. 1:27.

Phorinae Enderlein, 1908, Zool. Jahrb. Syst. 27:146.

Phorini Enderlein, in part, 1924, Ent. Mitt. 13 (6):277.

Diploneurini Enderlein, in part, 1924, Ent. Mitt. 13 (6):271.

The members of this subfamily are characterized by having a pair of bristles at basal fourth of middle tibia (except in *Brachyselia* Schmitz), by having the mesopleuron not divided by a vertical suture (except in *Nossibea* Schmitz), and by having the supra-antennal bristles always directed posteriorly. The females are fully winged, except in *Contopteryx* Schmitz and *Diplonevra* Subg. *Apo-pteromyia* Beyer. Two genera, *Diplonevra* Lioy and *Conicera* Meigen, occur in Hawaii.

Genus CONICERA Meigen

Conicera Meigen, 1830, Syst. Besch. Zweifl. Ins. 6:226.

These are small flies characterized by the unforked radial vein; by the apical arista; and by the paired basal bristles on the hind tibiae. The third antennal

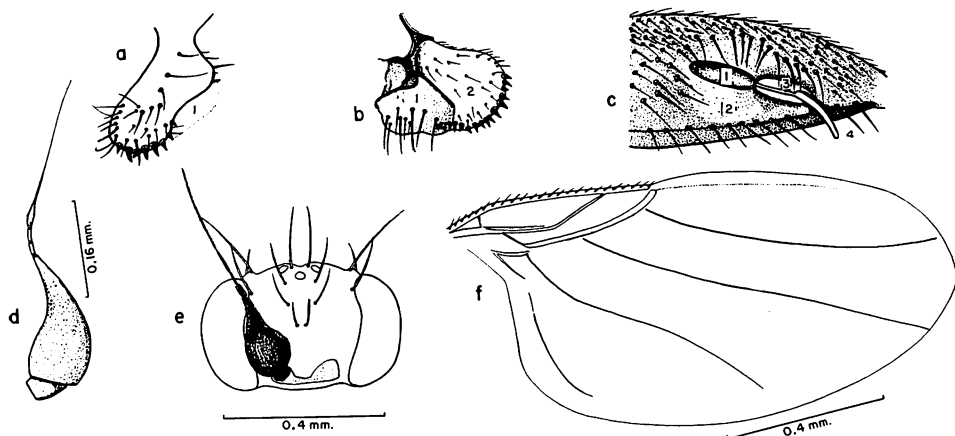


Figure 74—*Conicera* (*Tritoconicera*) *hawaiiensis* Colyer: (Figures a–c are from Colyer, 1957: 234 and 237.) a, left clasper of male genitalia (1. hairless area); b, right clasper (1. proximal lobe, 2. distal lobe—from macerated specimen); c, middle femur, posterior view, showing special sense organ (1. smaller fovea, 2. larger depressed area, 3. raised area, and 4. tubular spur-process—from dried specimen, partly diagrammatic); d, third antennal segment and arista; e, head, frontal view; f, wing.

segment is elongated and cone-shaped in the male, rounded in the female. The costa has a fringe of bristles; these form a single row at the tip rather than the usual double series. All of these characters are also found in *Darwiniphora* Schmitz (confined to Patagonia and Chile), but this genus, has, however, prociliate antial bristles.

Type of the genus: *Phora dauci* Meigen; *Conicera atra* Meigen is a synonym. See Schmitz (1956:381) and Colyer (1957:232).

The genus *Conicera* consists of 23 species and is divided into three subgenera, viz., *Conicera* (2 spp.), *Hypocerina* Malloch (7 spp.), and *Tritoconicera* Schmitz (9 spp.); the subgeneric position of 5 species is not recognizable from the descriptions alone.

For information on the larval stages of the three subgenera, refer to Schmitz (1952:283).

Only the subgenus *Tritoconicera* is represented in Hawaii.

Subgenus **TRITOCONICERA** Schmitz

Conicera (*Tritoconicera*) Schmitz, 1952, in Lindner, Die Flieg. der Palaarkt. Region 33:281.

Members of this subgenus are distinguished from typical *Conicera* and *Hypocerina* by having a complicated sense organ on the posterior surface of the middle femur of the male (fig. 74c); veins M_{3+4} and $Cu_1 + 1st\ A$ (veins 6 and 7 of

Schmitz) do not reach the wing margin (fig. 74f); and the male claspers are blunt and rounded and armed with short peg-like setae around the apices (fig. 74b) (in *Conicera*, s. str., the claspers are sharply pointed at apices and lack the numerous peg-like setae; see Schmitz, 1952:286, fig. 163c, d, e). The supra-antennal bristles are present in both sexes and anterior laterals are lacking. For a thorough discussion of the group as well as the whole genus see Schmitz (1952:281–300).

Type of subgenus: *Conicera tibialis* Schmitz.

Conicera (Tritoconicera) hawaiiensis Colyer (fig. 74a–f).

Conicera (Tritoconicera) hawaiiensis Colyer, 1957, Proc. Haw. Ent. Soc. 16:233.

Parafannia molluscovora Joyce (nec Bohart), 1954, Proc. Haw. Ent. Soc. 15:273. Based upon a misidentification.

Endemic? Oahu (type locality: Honolulu). The earliest collection record is March, 1916. Most of the specimens have been collected on windows. The species probably breeds in a wide variety of decaying organic matter. It has been reared from poultry manure and in rotting potatoes and other vegetable matter. Joyce (1954:273) misidentified the female of this species as *Parafannia molluscovora* Bohart; see Colyer (1957:232). It is probably on all of the islands.

Type in the United States National Museum.

This species is apparently related to *C. breviciliata* Schmitz but is differentiated by the male genital characters; by the development of the sensory structure on the posterior face of the middle femur; by the comparative lengths of the front tarsal segments; by the size and arrangement of the head bristles; and by the details of the wing venation as pointed out by Colyer (*loc. cit.*). Compare figure 74a, b, and c with Schmitz (1952: figs. 162 and 167c, d).

C. hawaiiensis is very readily separated from all other Hawaiian phorids by the cone-shaped antennae of the male; by the presence of a pair of dorsal bristles on the basal fourth of the hind tibia, and by the simple radial sector; as well as by the peculiar sense organ on the middle femur of the male, and other details. This is a small, opaque black species with hyaline wings. It has been very adequately described by Colyer in the original. For structural details of the antennae, wings, sensory organs on middle femur, male claspers, and the details of the frontal bristles refer to figure 74a–f.

Length of body: male, 0.9–1.3 mm.; female, 1.3–1.5 mm.

Genus **DIPLONEVRA** Lioy

Diplonevra Lioy, 1864, Att. Ist. Veneto Sci. (3) 10:77.

Diploneura Lioy, Schmitz, 1929, Rev. der Phoriden, Berlin p. 105.

Members of this genus are distinguished from other Phorinae by the presence of supra-antennal bristles; by having the middle tibia with a pair of strong

dorsal bristles situated near the basal fourth; and by having the hind tibia with one or several lines of hairs (hair seams) extending down the dorsal surface (fig. 75b). The wings are fully developed, except in *Apopteromyia* Beyer; the radial sector is mostly forked, but simple in *D. dohrniphoroidea* (Assmuth) and in *D. evanescens* Brues.

Aside from some synonyms, about 106 species have been described in this genus; these belong to 5 subgenera: *Diploneura* Lioy (39 spp.), *Dohrniphora* Dahl (50 spp.), *Tristoechia* Schmitz (2 spp.), *Apopteromyia* Beyer (monotypic), and *Aenictomyia* Brues (1 sp.); 9 species are fossiliferous and the subgeneric position of 5 or more is doubtful.

A few species are termitophilous and myrmecophilous; most of the species, however, are probably scavengers. For details of the morphology of the larval stages see Schmitz (1949:209–214).

Type of genus: *Phora florea* Fabricius.

KEY TO KNOWN SUBGENERA AND SPECIES OF DIPLONEURA IN HAWAII

- Mesopleura bare
 **Diploneura (Diploneura) peregrina** (Wiedemann).
 Mesopleura setulose on upper portion.....
 **Diploneura (Dohrniphora) cornuta** (Bigot).

Subgenus **DIPLONEURA** Lioy

Diploneura (Diploneura) Lioy, Schmitz, 1929, Rev. der Phoriden, Berlin p. 105.
Phorynchus Brunetti, 1912, Rec. Ind. Mus. Calcutta 7:445–513.
Pentagynoplax Enderlein, 1924, Ent. Mitt. Berl., Dahlem 13:237.

The members of the typical subgenus are characterized by having the wings fully developed in both sexes; by having the mesopleura bare; by having two rows of closely placed, short hairs on the hind tibia (fig. 75b); and by lacking sensory pegs on the hind femur.

Type of the subgenus: same as for the genus.

Only one species is known from Hawaii.

Diploneura (Diploneura) peregrina (Wiedemann) (fig. 75a–c).

Trineura peregrina Wiedemann, 1830, Aussereurop. Zweifl. Ins. 2:600.

Phora sinensis Schiner, 1868, Dipt. Novara Reise p. 223.

Phora conventa Brues, 1911, Ann. Mus. Nat. Hung. 9:537.

Dohrniphora setitibia Malloch, 1925, Proc. Linn. Soc. N. S. Wales 1 (4):333.

Oahu, Hawaii, Maui, and Kauai. Probably present on all the islands.

Immigrant. East Asia, southwest Pacific, and New South Wales. Type locality:

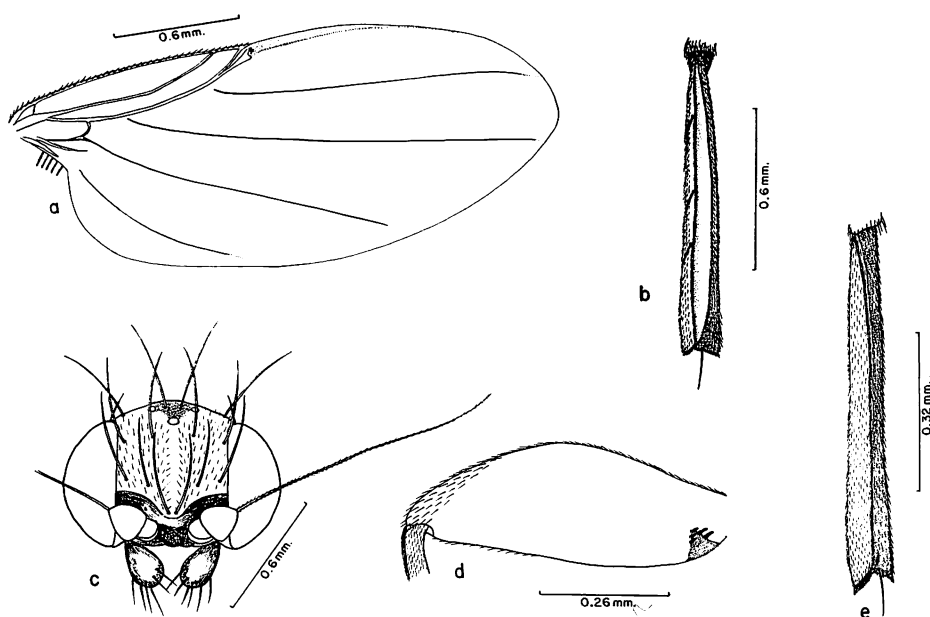


Figure 75—*Diploneura (Diploneura) peregrina* (Wiedemann): a, wing; b, hind tibia of male, dorsal view; c, head, front view. *Diploneura (Dohrniphora) cornuta* (Bigot): d, hind femur of male, posterior view; e, hind tibia, dorsal view.

Canton. First record in Hawaii by Hardy (1952:457); the earliest record in Hawaiian collections in 1908 taken on Mt. Tantalus.

Location of type: unknown.

The identification of *D. peregrina* should not cause any difficulty as it differs markedly from any other *Diploneura* hitherto described. It is readily distinguished from other Hawaiian phorids by its larger size and by the generic and subgeneric characters given above. It is moderately large, chiefly rufous, with abdominal terga two to six as well as the terminalia of the female predominantly black, and the abdomen of the male with a large black spot on each side of terga two to five, and with a narrow yellow border at apex of each tergum. For structural details refer to Schmitz (1949:233), who has given an excellent redescription of the species. For details of the head, wing, and hind tibia refer to figure 75a, b, and c.

The female is similar to the male in most respects except that it is comparatively larger in size and the abdomen is more completely blackened. There are only four abdominal terga; the fourth is somewhat shortened.

As Schmitz has pointed out (*loc. cit.*), *D. peregrina* is apparently intermediate between the *D. florea* and *crassicornis* groups.

Length: male, 2.75–3.00 mm.; female, 3.75–4.30 mm.

This species is obviously a scavenger; it is common around garbage cans and refuse dumps.

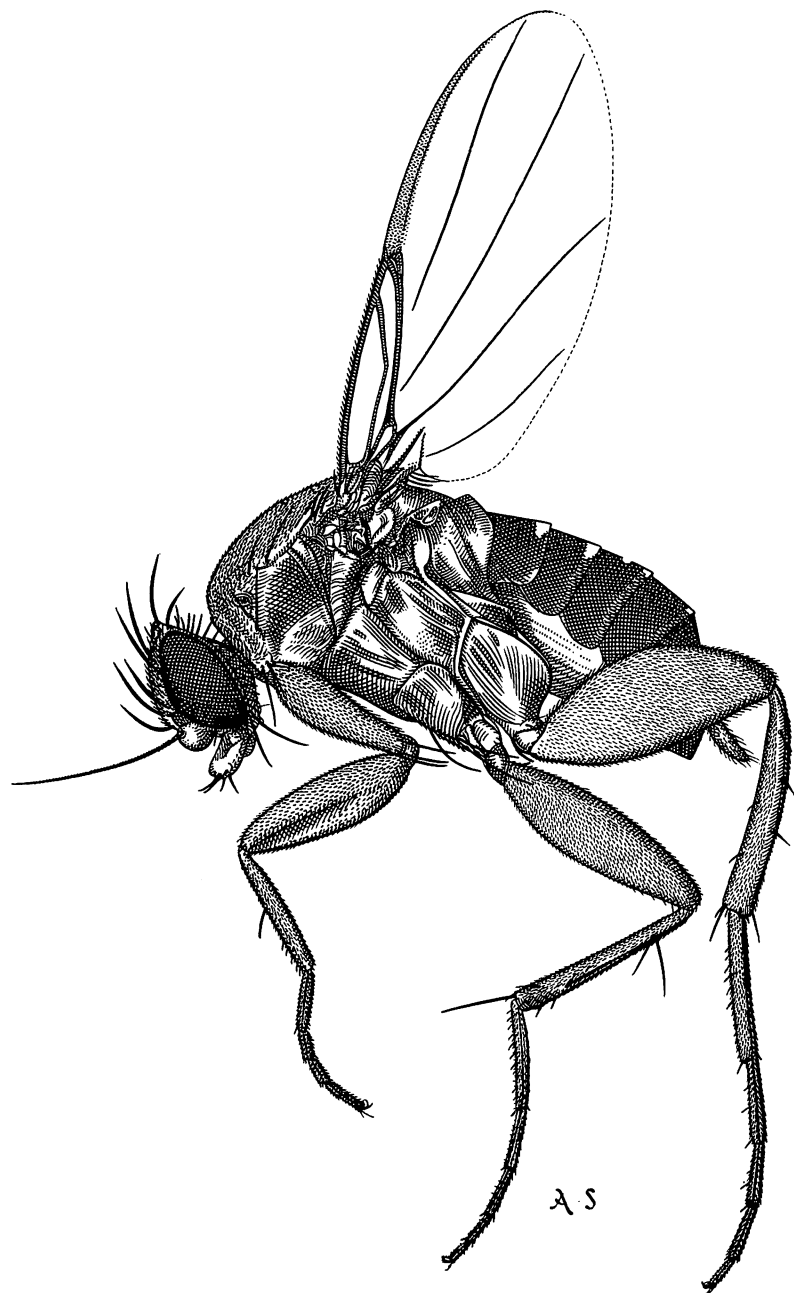


Figure 76—*Diploneura peregrina* Wiedemann.

Subgenus **DOHRNIPHORA** Dahl

Dohrniphora Dahl, 1898, Sitz. Ber. Ges. Nat. Fr. 10:188.

Pronomiophora Enderlein, 1912, Stett. Ent. Ztg. p. 46.

Crepidopachys Enderlein, 1912, Stett. Ent. Ztg. p. 16.

Diploneura (*Dohrniphora*) Dahl, Schmitz, 1927, Natuurh. Maandbl. 16:46.

Members of this subgenus are distinguished from *Apopteromyia* by having the wings fully developed in both sexes; from *Aenictomyia* by the presence of only two pairs of dorsocentral bristles; from *Tristoechia* and typical *Diploneura* by having the upper portion of each mesopleuron setose; by having one row of short, closely set hairs down the dorsal surface of the hind tibia (fig. 75e); and by having a clump of short, sensory pegs on the posteroventral surface, near base, of hind femur of the male (fig. 75d). Vein M_1 is evenly concave, not straight as in *Tristoechia*, neither bisinuous as in most of the typical *Diploneura*.

Type of subgenus: *Dohrniphora dohrni* Dahl.

Only one species is known from Hawaii.

***Diploneura* (*Dohrniphora*) *cornuta* (Bigot) (fig. 75d-e).**

Phora cornuta Bigot, 1857, in de la Sagra's Hist. Phys. Pol. et Nat. de l'île de Cuba p. 827.

Phora navigans Frauenfeld, 1887, Verh. zool. bot. Ges. Wien 17:454.

Phora cleghorni Bigot, 1890, Ind. Mus. Not. 1 (4):191.

Phora venusta Coquillett, 1895, Can. Ent. 27:107.

Phora divaricata Aldrich, 1896, Trans. Ent. Soc. Lond. 3:437; Synonymy from Malloch, 1912, Proc. U.S. Nat. Mus. 43:432.

Phora chlorogastra Becker, 1902, Abhandl. K. K. Zool. Bot. Ges. Wien 1:32.

?*Phora divaricata* var. *perplexa* Brues, 1903, Trans. Am. Ent. Soc. p. 350.

Dohrniphora divaricata var. *basalis* Santos, 1911, Mem. ci. art. Barcelona 3 (17):11.

Dohrniphora divaricata var. *obscura* Santos, 1911, Mem. ci. art. Barcelona 3 (17):11.

Phora mordax Brues, 1911, Ann. Mus. Nat. Hung. 9:531.

Dohrniphora bequaerti Schmitz, 1914, Jaarb. Nat. Hist. Gen. Limburg p. 105.

Oahu, Hawaii. Probably on all of the main islands.

Immigrant. Widespread throughout the tropics and temperate regions of the world. It breeds in all kinds of decaying organic matter, in much the same habitat as *Megaselia* (*Meg.*) *scalaris* (Loew).

Type in the Musée National d'Histoire Naturelle, Paris, (Guérin-Ménéville collection), according to Schmitz (1951:241).

D. cornuta belongs to a very difficult group characterized by the loss of all hind leg bristles; by the presence of only four abdominal terga in the female; by having only two scutellar bristles; and by having the mouthparts not especially

prominent. It is a moderate-sized species, rather variable in color; the mouthparts, halteres, legs, first abdominal tergum, venter, and anal protuberance of the male hypopygium are yellow, the remaining part of the body is usually blackish; the pleura are bicolored, viz., the upper two-thirds are black, the lower portion yellow, this in contrast to the otherwise closely allied *D. dohrni* Dahl. The males of *cornuta* are readily recognized from related congenics by the details of the hind femur (fig. 75d); the female is, however, not distinguishable from certain tropical species. In Hawaii, both sexes are easily distinguished from other phorids by the subgeneric characters given above. For more structural details refer to the very adequate redescription of Schmitz (1951:242).

Length: male, 1.5–2.3 mm.; female, 1.5–2.6 mm.

Subfamily METOPININAE Rondani

Metopinina Rondani, 1856, Dipt. Ital. Prodr. 1:27.

Gymnophorini Enderlein, in part, 1924, Ent. Mitt. 13 (6) :273.

Metopinini Enderlein, in part, 1924, Ent. Mitt. 13 (6) :280.

Metopininae Schmitz, 1929, Rev. der Phoriden, Berlin p. 69.

The members of this subfamily are characterized by the loss of all leg bristles, and by having the mesopleuron divided by a vertical suture. The subfamily falls into two quite natural groups, viz., *Beckerinini* with the supra-antennals posteriorly directed, and *Metopinini*, the postantennals of which are proclinate or absent. All *Beckerinini* are fully winged in both sexes, many tropical genera of the *Metopinini* are brachypterous or even apterous in the female, very seldom in the male (viz., the European *Gymnophora* subgenus *Capraephora* Bezzi, and the African genera *Aptinandria* Schmitz and *Arrenaptenus* Schmitz). Four genera and one subgenus of *Metopinini* occur in Hawaii, viz., *Megaselia* Rondani (and *Aphiochaeta* Brues), *Metopina* Macquart, *Puliciphora* Dahl, and *Chonocephalus* Wandolleck.

Genus MEGASELIA Rondani

Megaselia Rondani, 1856, Dipt. Ital. Prodr. 1:137.

A very large genus which includes more than one-third of all the known phorids of the world. Up to 1955, 850 species had been described, and at least 106 of these are synonyms (see Schmitz, 1956:402).

Megaselia has twelve reclinate frontals arranged in three transverse rows of four bristles each, in addition to two to four proclinate postantennals. Contrary to the cosmopolitan genus *Phalacrotophora* Enderlein the antials are always more or less convergent. The third antennal joint is rounded, never elongated, some-

- 5(2). Front and thorax all yellow to rufous. Abdominal terga black on the sides and yellow in the median portions. Upper postantennal bristles widely spaced; the distance between the two is twice the distance between the lower pair (fig. 80a) *scalaris* (Loew).
Front and thorax brown to black. Abdomen black with not more than narrow yellow markings on the apices of the segments 6
- 6(5). Fork of wing very small. Anal tube relatively long in male *furcatilis* Beyer n. sp.
Fork of radial vein decidedly large (see fig. 78d); anal tube in male very short and stout 7
- 7(6). Male 8
Female 9
- 8(7). End joint of front tarsus considerably enlarged
..... *heterodactyla* Beyer n. sp.
Last joint of front tarsus not enlarged species No. 2.
- 9(7). Abdomen with a white, conspicuous transverse band, fourth tergum lacking (fig. 81b) *zebrina* Beyer n. sp.
Abdomen uniformly black 10
- 10(9). First costal section about equal to the second; apex of abdomen beset with very long hairs
..... *longibarba* Beyer n. sp.
First costal section noticeably longer than second 11
- 11(10). Apex of abdomen conspicuously clothed with short, densely placed hairs *curtibarba* Beyer n. sp.
Apex of abdomen lacking such minute, closely placed hairs *heterodactyla* Beyer n. sp.

Subgenus **APHIOCHAETA** Brues

Aphiochaeta Brues, 1904, Trans. Amer. Ent. Soc. 29:337.

Mallochiana Schmitz, 1918, Jaarb. Nath. Gen. Limburg (1917), p. 21.

Pogonopleura Enderlein, 1924, Ent. Mitt. Berlin-Dahlem 13:275.

Stirocnemis Enderlein, 1927, Stett. Ent. Ztg. 88:109.

Megaselia (*Aphiochaeta*) Brues, Schmitz, 1926, Ent. Mitt. Berlin-Dahlem 15:47.

Members of the subgenus are characterized by having the hind tibiae without anterodorsal setulae; and by having the mesopleura either uniformly bristled or with one or several bristles conspicuously differentiated.

Type of subgenus: *Phora nigriceps* Loew.

Megaselia (Aphiochaeta) setaria (Malloch) (fig. 77a–b).

Aphiochaeta setaria Malloch, 1912, Proc. U. S. Nat. Mus. 43 (1938) :514.

Megaselia stuntzi Bohart, 1947, Proc. U. S. Nat. Mus. 96 (3205) :402, fig. 35.

New synonym.

Oahu, Kauai, Maui (type locality: "Maui"). Probably common on all of the main islands.

Immigrant. Guam.

Type in the U. S. National Museum.

This is apparently the one species of the subgenus *Aphiochaeta* which occurs in Hawaii, so the species is readily differentiated by the patch of setae on the posterodorsal portion of each mesopleuron (fig. 77b).

M. setaria falls into Schmitz's group 1 (1946:405) by having four scutellar bristles. Specimens of *M. stuntzi* Bohart from Guam have been compared with specimens from Oahu and Kauai and found to be conspecific; these in turn have been compared with Malloch's type female of *setaria* from Maui, and no specific differences have been noted. The head bristles (fig. 77a) would appear to be differently arranged than those of *M. stuntzi* as figured by Bohart in the original, but comparison of further specimens indicates that his figure was not completely accurate. In Brues' key to the Philippine *Megaselia*, *setaria* runs to couplet 32 (1936:375); it does not fit the characters given in the key beyond that point.

Subgenus **MEGASELIA** Rondani

Megaselia Rondani, 1856, Dipt. Ital. Prodr. 1:137.

? *Trisometopia* Lioy, 1864, Atti. Ist. Veneto (3) 10:77.

? *Obelosia* Lioy, 1864, Atti. Ist. Veneto (3) 10:77.

? *Trichometopia* Becker, *et al.*, 1907, Kat. Pal. Dipt., p. 175.

Heterophora Borgmeier, 1923, Deutsch. Ver. Wiss. Kunst, S. Paulo, 3:158, *nec*

Heterophora Santos, 1921, Mem. Acad. Barcelona 17 (1) :81.

Lioyella Enderlein, 1924, Ent. Mitt. Berlin-Dahlem, 13:275.

Megaselia (*Megaselia*) Rondani, Schmitz, 1926, Ent. Mitt. Berlin-Dahlem, 15 (1) :50–57; Schmitz, 1927, Maandbl. Natuurh. Genootsch. Limburg 16:111.

Type the same as for the genus.

Characterized by having the mesopleura entirely bare and the hind tibiae without a complete row of anterodorsal setulae.

Megaselia (Megaselia) brunneipalpata Beyer, new species (fig. 77c).

In Lundbeck's key to the European species this runs to *cinerella* Lundbeck (*recte bovista* Gimmerthal) and it is obviously closely related to this species. *M. brunneipalpata* differs, however, by having the anal tube much shorter, the front as long as broad, as well as by other details.

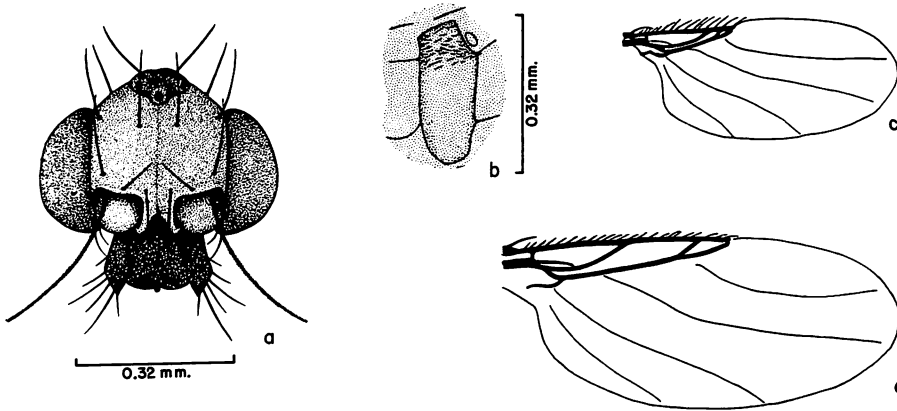


Figure 77—*Megaselia (Aphiochaeta) setaria* (Malloch): a, head, front view; b, mesopleuron. *Megaselia (Megaselia) brunneipalpata* Beyer n. sp.: c, *wing. *M. (Megaselia) curtibarba* Beyer n. sp.: d, *wing. (* Drawn by Erwin Beyer, Bad Godesberg, Germany; no scale indicated.)

MALE. Head: Front subquadrate, almost as broad as high, its surface deep black and subshining. Ocellar tubercle concolorous and distinctly raised. The median impressed furrow of the front is distinct. The fine hairs on the front are less conspicuous than in *koffleri*. Two pairs of supra-antennal bristles are present; the lower ones are not much thinner but are distinctly shorter than the upper bristles (4:5 or 3:4), which are clearly more distant (4:2.5). Antials more or less convergent, set somewhat deeper than the upper supra-antennals and approximately midway between these and the inner eye margin, so they are situated much nearer to the eye than to the median impressed line. Preocellar row of bristles slightly bent downwards medially and nearly equidistant, preocellar bristles more widely spaced than the upper supra-antennals. Second lateral bristle a little farther from the lower one than from the upper bristle. Third antennal segment black, of normal size and form, i.e., rounded with a very slight apex. Arista normally pubescent, almost twice as long as the height of the front (30:17). Palpi brownish, rather dark, and medium-sized. Ventral margin with seven or eight bristles, two of which are small and rather hairy; the other bristles are strongly developed and nearly of equal length. **Thorax:** Black, pleura with some faint reddish markings which are not well defined. Two scutellar bristles are present. The mesonotum is somewhat shining and the mesopleura entirely bare. **Legs:** Brownish, fore legs much lighter than the hind ones. Fore tarsi slender, each joint longer than broad; metatarsal segment 0.21 mm. long, fourth segment as long as fifth. Mid-leg: Ratio of metatarsus and tibia 31:19 (i.e., 0.496:0.304 mm.). Posterodorsal cilia very weak and short. Hind femora three times as long as broad (0.704:0.240 mm.); the ventral margin bears five pairs of short, closely placed cilia, followed by four cilia of equal length which are distinctly separated from the basal cilia. The tibiae are slightly longer than the femora, 0.720 mm., and have numerous but inconspicuous posterodorsal cilia. The ratios of tarsal

joints are 24:15:11:8.5:7 (fifth joint without praetarsal organs). *Wings*: (fig. 77c). Faintly tinged, approximately twice as long as broad (1.584:0.752 mm.). Costal index 0.39; ratios of costal sections 21:6:6, thus 1 is more than three times 2 and nearly twice as long as 2+3. Costal cilia moderately long, measuring about 0.099 mm.; about 12 pairs of cilia are present: 9 on the first costal section, and about 3 each on the second and third sections. Radial fork rather small, not elongated, posterior branch not angulated. Vein M_1 arising slightly beyond the fork and gently curved at base. Halteres bright yellow. *Abdomen*: Widest at segment two. Segments two and six slightly elongated, segments three to five of equal length. Terga dull black, with extremely short, fine hairs and no long pile. Hind margins of the second to fifth terga indistinctly pale colored, nearly white. Venter black, sparsely haired. Hypopygium moderate-sized, mainly hidden, and dull black. The genitalia are apparently formed as in *bovista* (Gimmerthal) as near as can be ascertained without dissection. The anal tube, however, seems to be stouter and shorter in *brunneipalpata*.

Length: about 1.5 mm.

FEMALE. Unknown.

Holotype male: Keanakolu, Hawaii, 5,200 feet, October, 1952 (D. E. Hardy).

One paratype male: same locality and collector, August, 1957.

Type in the B. P. Bishop Museum. Paratype in the U. S. National Museum.

***Megaselia (Megaselia) curtibarba* Beyer, new species (fig. 77d).**

This species is in many respects most closely allied to *M. longibarba* Beyer, n. sp., and only the diagnostic features which will separate these two are given below.

FEMALE. *Wing*: (fig. 77d). More distinctly infuscated with brown than in *longibarba*. Wing of paratype 2.32 mm. long and 1.056 mm. broad, thus stouter than in *longibarba*. Costa considerably shorter, index 0.56–0.57. Ratio of costal segments 34:27:13, thus the first section is distinctly longer than the second. Cell of radial fork about medium-sized, not elongated. Vein M_1 arising just slightly beyond the fork of R_s , thus more basal than in *longibarba*; the S-curve at base of fourth vein is very short, scarcely developed. *Abdomen*: Relatively stouter and shorter than in *longibarba*, widest at third (not second) segment. Fifth tergum somewhat enlarged and shining, with the sides much more convergent behind than in *longibarba*. Anterior margin 0.24 mm. wide, posterior margin 0.256 mm., median length 0.296 mm. Sixth tergum much shortened, developed only as a very narrow transverse band; ratio of lengths of segments five and six 18.5:4 (in *longibarba* 14:11). Each tergum has only delicate, fine hairs. Membranous parts of the postabdominal segments conspicuously clothed with very densely placed, minute hairs; the species is very easily recognized by this striking character which is peculiar to *curtibarba*.

Length: 1.8–1.9 mm.

MALE. Unknown.

Holotype female: Kahana Ridge, Oahu (without date or collector). One female paratype: Mt. Tantalus, Oahu (XII, 1951), (M. S. Adachi).

Type in the B. P. Bishop Museum. Paratype in the United States National Museum.

Megaselia (Megaselia) furcatilis Beyer, new species (fig. 78a-b).

Megaselia furcatilis is apparently not related to any other known species, although the wing venation is rather similar to that of *M. scalaris* (Loew); it differs essentially from the latter by its predominantly black body. In Malloch's key to the *Megaselia* species of Samoa (see Malloch, 1935:331-332), it runs to *M. safuneae* Malloch, but is distinct from that species in color as well as in other details. In Brues' key to the *Megaselia* of the Philippine Islands (see Brues, 1936:426) *furcatilis* runs to *linoensis* Brues, which differs from *furcatilis* by having a much longer costal vein (index 0.62). In Brues' key to the *Megaselia* of Formosa (see Brues, 1924:209) it runs to *brunnicans* Brues; the wing venation of this, however, does not agree with the present species. Concerning structural differences from *M. setifemur* Bohart (see Bohart 1947:398), little can be said; the costal cilia of that species are described as long and the form and chaetotaxy of the hypopygium are different; also *setifemur* has the halteres brownish, not yellow. *Megaselia suis* Bohart, also known from Guam, cannot possibly be confused with *furcatilis* because of its striking color. (Bohart, *loc. cit.*, p. 402, says of *M. suis*: "It is close to *sauteri* Brues from the Philippines (Brues 1936)"; this is evidently an error, as *M. sauteri* was described by Brues from Formosa in 1911.)

MALE. *Head*: Front subquadrate, about as long as broad, its surface dull, grayish black, sometimes with a faint brownish ground color showing through. Ocellar tubercle well defined, raised and deep black; furrow distinct. Fine hairs inconspicuous, numerous, and short, standing in small but distinct black punctures. Postantennal bristles not long, upper bristles separated by about one-fifth the width of the front (3:16); lower proclinate bristles much smaller, and a little closer together. Antials not lower than the upper supra-antennals, occupying more than three-fifths the frontal width (9:16), more or less midway between the eye margin and the upper postantennals; sometimes they are a little nearer to the median furrow. Lowest lateral bristle decidedly above the antial, close to the inner eye margin. Second transverse row of four reclinate frontals not, or but slightly, convex below, its bristles not always equidistant. The preocellars are distinctly farther from each other than the upper postantennals (5:3), occupying less than one-third the width of the front (5:16). Second lateral bristle noticeably nearer to the upper than to the lower bristle. Third antennal joint rounded, conspicuously enlarged; its diameter is about 0.134 mm. The antenna is predominantly black dorsally and apically but is sometimes entirely rufous. Arista rather short pubescent and one and one-fourth times the height of the front, in one paratype measuring 0.336 mm. Palpi bright yellow, not broad, medium-sized to small; the distal half of the ventral margin is clothed with about six short bristles, terminal bristle not differentiated. *Thorax*: Dark brown to black, mesonotum subshining.

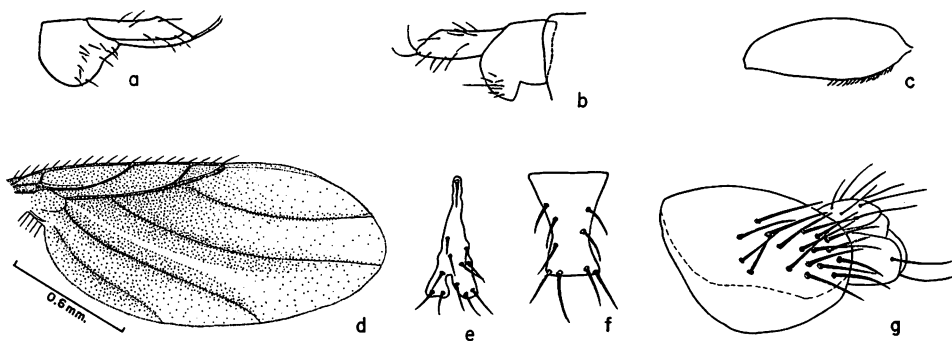


Figure 78—*Megaselia* (*Megaselia*) *furcatilis* Beyer n. sp.: a, *hypopygium, left side; b, *hypopygium, right side. *M. (M.) heterodactyla* Beyer n. sp.: c, *hind femur; d, wing; e, *seventh tergum of female; f, *seventh sternum of female; g, *hypopygium of male. (* Drawn by Erwin Beyer, Bad Godesberg, Germany; no scale indicated.)

Scutellum with four bristles; the anterior pair, however, are weakened and often reduced to small hairs. Mesopleura bare. *Legs*: Yellowish; front legs, including coxae, bright yellow. Hind legs darker, femora blackened at tips. Mid and hind coxae dark brown. Fore tibia 0.35 mm. long, tarsi but a little longer (0.448 mm.). Ratios of tarsal segments 50:19:17:14:17; thus the apical segment is distinctly longer than the penultimate and about as long as the third. Middle femur 0.59 mm. long and 0.176 mm. broad, base with some weak, densely placed, curved hairs ventrally. Middle tibia 0.48 mm. long, posterodorsal cilia conspicuous. Apical spur nearly as long as the metatarsus (6:7). Hind tibia 0.688 mm. long and 0.256 mm. broad; first half of ventral margin clothed with a fringe of about 12 cilia of medium length. Tibia 0.61 mm. long, with the spur very short (0.112 mm.). Posterodorsal setulae inconspicuous on the proximal half, becoming more visible on the distal half of tibia. Hind basitarsus 0.336 mm. long. *Wings*: Lightly infuscated; the wing of a paratype is 1.376 mm. long and 0.61 mm. broad. Costal index 0.49–0.5; ratios of costal sections 18:13.5:5, thus one is about equal to two plus three. Costal cilia short, 0.054 mm., about 10 cilia situated on the first section and 8 on two plus three. Fork of radial vein somewhat acute-angled and cell R_3 is small. Vein R_{4+5} not angulate. Vein M_1 arising slightly beyond the fork, without any s-curve, rather concave throughout. Anal angle well developed. Knobs of halteres yellow. *Abdomen*: Widest at the end of the second segment, tapered apically. Terga all black, rather opaque, not banded behind. Minute hairs delicate, more conspicuous laterally and on the hind corners; on the sides of the second tergum is a tuft of 3–5 stiff, moderately long bristles. First dorsal plate short, second and sixth slightly elongated, and third to fifth nearly equal in length. Venter dark, clothed with a few scattered hairs. Hypopygium moderate in size and dull brown to black. From a lateral view, the epandrium appears to be distinctly higher than long in dried specimens, but after dissection it appears to be as long as high on the left side (fig. 78a), and a little longer than

high on the right (fig. 78b). Near the hind corners of the epandrium are some delicate hairs, one of which is much elongated on the right side, but not at all bristle-like. Anal tube slender, distinctly longer than the epandrium. End hairs stronger than the remaining hairs (fig. 78a).

FEMALE. Similar to the male, except for sexual differences. The antennae are, however, not enlarged. The ventral fringe of the hind femur is as in the male. Abdomen with all terga fully sclerotized and with some long hairs along the hind margin of the sixth dorsal plate. Terminalia yellowish, not horny.

Holotype male: Honolulu, Oahu, April, 1958, on window (D. E. Hardy). Allotype female: same locality and collector, April, 1952.

Type and allotype in B. P. Bishop Museum.

Megaselia (Megaselia) heterodactyla Beyer, new species (fig. 78c-g).

A dark-colored species with an elongate, short ciliated costa. The male is readily recognized by the enlarged fifth segment of the front tarsus; by the hypopygial structures; and by the characteristic fringe on the hind femur (fig. 78c). The female resembles *M. zebrina*, *longibarba*, and *curtibarba* n. spp.; it differs, however, from *zebrina* by having the abdomen all black, from *longibarba* and *curtibarba* by lacking any long, or densely placed hairs at apex of abdomen.

FEMALE. Head: Front black or reddish, often with a faint grayish subshining ground color; distinctly broader than long (e.g., 0.352:0.26 mm.). Ocellar triangle distinct, concolorous. Median impressed line well defined. Fine hairs short and inconspicuous. Four supra-antennal bristles present; the lower pair is considerably smaller and closer together than the upper pair (2.3:4). The upper bristles are separated by one-sixth the width of the front. The lower lateral bristle is on a level with the upper proclinate bristle, and the antial bristle is situated a little lower. The antials are convergent, separated by about five-sevenths (e.g., 15:22) the width of the front, somewhat closer to the eye than to the upper supra-antennal bristle; consequently it is situated much farther from the median furrow than from the inner eye margin. Preocellar row consisting of four more or less equidistant bristles; the laterals are set a little higher than the middle bristles. Preocellars much more distant from each other than the upper supra-antennal bristles. Second lateral bristle set slightly closer to the upper than to the lower bristle. Third antennal segment dark opaque brown, medium-sized and rounded with a slight point at apex. Arista thickly pubescent, nearly twice as long as the height of the front (e.g., 0.48). Palpi rather broad, not quite half as broad as long (excluding the stipes at base 7:18, or 0.115:0.048 mm.). Ventral margin of each palpus with six well-developed bristles which are arranged in two rows of three each; apical bristle not differentiated. **Thorax:** Mesonotum subshining dark brown or reddish; no bristly hairs are present between the two dorsocentrals. Scutellum with two bristles. Pleura brownish, mesopleura bare. **Legs:** Including coxae, brown; tibiae and tarsi of front legs yellowish, hind femora black except at apices. Front tibia without cilia, ratio of basitarsus and tibia 7:13 (0.224:0.416 mm.). Each tarsal seg-

ment is longer than broad; the fifth is as long as the preceding segment. Mid tibia with very weak posterodorsal cilia, apical spur rather short. Hind femur about three times as long as broad, ventral margin with some weak hairs basally. Hind tibia slightly shorter than the femur, e.g., 0.72 mm., posterodorsal cilia very numerous and inconspicuous. *Wings*: (fig. 78d). Strongly infuscated, slightly over two times longer than wide (1.720 mm. long, 0.752 mm. broad). Costal index about 0.6, ratios of costal sections 28:16:13, varying but slightly. Costal cilia very short and closely placed, 0.083 mm. long, marginal row with about 15 cilia on the first costal section and about 10 cilia on sections two plus three. The cell formed by the fork of the radial vein is large and elongate, not acutely angled; its posterior branch is not angulate and is as long as the second costal section. Vein M_1 arising well beyond the fork, more strongly curved at the beginning and nearly straight, just slightly recurved on the distal fifth or sixth. Knobs of halteres dark, black or brown. *Abdomen*: Widest at segment two, tapering behind. Terga fully sclerotized, brownish black, sometimes distinctly shining; terga two to four, or five, with pale narrow crossbands posteriorly. First tergal plate very short, plates two to five of nearly equal length. Fifth tergum with the sides subparallel, less than half as long as wide anteriorly (3:7, i.e., 0.192:0.448 mm.). Apex of the sixth tergum rounded, sides convergent behind. In one example (examined after dissection in lactic acid) the anterior margin was 0.240 mm. and the posterior margin 0.172 mm.; the length of the plate is 0.128 mm. Anterior margin with a more or less semicircular membranous section which probably contains a sense gland. Such membranous parts, which are often not to be detected without dissection, are known to occur in various species of *Megaselia*, for instance in *Megaselia* (*Paraphiochaeta*) *picta* (Lehm.). Each abdominal tergum is clothed with short scattered hairs, which sometimes (not in the type specimen) are elongated at the hind margin of the fourth segment. Terminalia not horny; the tergal and ventral plates of segment seven are as in figure 78e and 78f. Cerci long and narrow, e.g., 0.704 mm. long, 0.128 mm. broad; terminal hair 0.69 mm. long.

MALE. Differing from the female by having the antennae a little larger; the front tarsi stout, but not flattened, and slightly shorter than the tibia (29:32, i.e., 0.46:0.51 mm.). The basitarsi are symmetrical, not broadened. The last tarsal segment is considerably enlarged, broader than the preceding one (5:4); ratios of tarsal segments when seen from above: 48:20:18:16:25. The front tarsi are thus exactly as in the male of *Megaselia* (*Aphiochaeta*) *digitalis* Schmitz (see Schmitz, 1957, p. 190, fig. 1). Hind femora (fig. 78c) rather broad, ventral margin with a characteristic fringe as in *Megaselia* (*Aphiochaeta*) *diversa* (Wood) (see Schmitz 1956, p. 390, fig. 6). Abdominal terga more conspicuously hairy than in the female. Hypopygium (fig. 78g) dull black, much longer than high, distal half clothed with densely set, strong hairs; long bristles, however, are lacking. Anal tube short and stout, not longer than high, grayish brown or blackish; terminal hairs distinct.

Length of body of both sexes about 1.6–1.8 mm.

Holotype female: Manoa Valley, Honolulu, Oahu, alt. 1,500 ft., July 4, 1936,

no collector given. Allotype male: Poamoho Trail, Oahu, alt. 1,700 ft., May, 1953 (M. S. Adachi).

Type and allotype in B. P. Bishop Museum.

Megaselia (Megaselia) koffleri Schmitz (fig. 79a-b).

Megaselia (s. str.) *koffleri* Schmitz, 1935, Broteria Ser. Ci. Nat. 4 (31), 1:11.

Megaselia biformis Brues, 1942, Proc. Haw. Ent. Soc. 11 (2):155. **New synonym.**

Oahu (type locality of *biformis* Brues: Honolulu, bred from the giant African snail, *Achatina fulica* Bowdich) and Maui. Probably found on all the main islands.

Immigrant: Palestine (type locality: Rehoboth); Egypt; Cabo Verde; Philippine Islands (Mt. Apo Region, 1 female (C. F. Clagg), in the collection of the Museum of Comparative Zoology). This species is commonly found breeding in dead snails, on dead insects, and in other rotting organic matter.

The above synonymy became evident after comparing specimens from North Africa with those from Hawaii.

Location of type: Württembergische Naturaliensammlung, Stuttgart, Germany.

MALE. Front subquadrate, very slightly longer than high (18:17); surface subopaque black, often with a reddish ground color showing through. Ocellar tubercle well defined, deep black. Median impressed line distinct. Fine hairs densely placed and fairly conspicuous. Four postantennal bristles, the lower pair slightly smaller and distinctly closer together than the upper bristles, which are separated by less than one-third the width of the front (5:17). Antial bristles situated distinctly below the upper supra-antennal bristles, midway between these and the inner eye margin; consequently they are situated much nearer to the eye than to the median furrow. Second transverse row of four approximately equidistant bristles only slightly bowed downward medially. Second lateral bristle a little farther from the lower one than from the upper bristle. Third antennal segment black or reddish, of normal form and comparatively small. Arista one and four-ninths the height of the front (e.g., 0.35 mm.); the pubescence is extremely short. Palpi bright yellow, not large, approximately three times as long as broad (10:27); ventral margin with two rows of three bristles each, four of which are rather long; apical bristle not distinctly longer than the other bristles. Thorax chiefly black; the sides of the mesonotum and the pleura are tinged with reddish brown, sometimes the entire mesonotum is reddish. One pair of dorsocentral bristles are present and between these is another pair of bristle-like hairs. Scutellum with one pair of bristles. Mesopleura entirely bare. Legs, including the fore coxae, yellow; middle and hind coxae brownish or yellowish; hind femora darkened apically. Front legs slender, a little more than three times as long as broad. Front tarsi not stout, distinctly longer than the tibia, the tarsal segments are more or less uniform in width throughout; the metatarsal joint is half as long as the tibia and the fifth joint is as long as the preceding one. Mid-femora more than three times longer than broad (32:9.5) and mid-tibia with

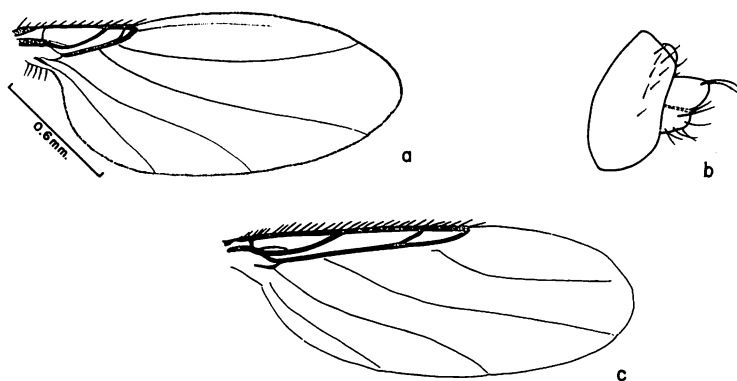


Figure 79—*Megaselia (Megaselia) koffleri* Schmitz: a, wing; b, *male hypopygium, right side. *M. (M.) longibarba* Beyer n. sp.: c, *wing. (* Drawn by Erwin Beyer, Bad Godesberg, Germany; no scale indicated.)

very weak posterodorsal cilia. Hind femora unusually not broadened, widest near the middle; this width is in the ratio of 17:41 with the length. Ventral margin of the femur with a series of about eight curved cilia on the basal half of the segment, these cilia rather weakly developed. Hind tibia with the dorsal palisade-like row of hairs not distinctly angulate, with a single series of about twelve rather inconspicuous cilia inside the seam. With regard to the relative length of femora, tibia, and tarsal joints, more details may be taken from the following pattern:

	FRONT LEG	MIDDLE LEG	HIND LEG
FEMUR	0.3520	0.5120	0.6560
TIBIA	0.3360	0.4160	0.4640
TARSUS I	0.1024	0.2431	0.3104
II	0.0544	0.1280	0.1648
III	0.0480	0.0992	0.1280
IV	0.0448	0.0736	0.1008
V	0.0448	0.0640	0.0800

Wings (fig. 79a) somewhat tinged with gray, a little more than twice as long as broad (e.g., 1.36:0.64 mm.). Costal index 0.30–0.31. Ratios of costal segments 61:20:15, thus the first section is about three times as long as the second and not quite twice as long as the second plus the third. About eleven pairs of short costal cilia are present, eight on the first section, and three on sections two and three. Fork very small, its anterior branch sometimes weak or even obsolete (as in the European *Megaselia (Aphiochaeta) pusilla* (Meigen)); posterior branch of fork sharply angulate in a characteristic way. Vein M_1 arising a little beyond the fork, not noticeably bent at the base. Halteres bright yellow. Abdomen widest at the end of the second segment, tapering behind. Terga dull, black, only the first tergum often reddish brown; each tergum has a narrow gray to yellow pollinose band across its hind margin. Some very fine, short hairs are present

along the hind margins and at the sides of the abdominal plates. The second tergum lacks lateral tufts of stiff bristles. Venter of abdomen grayish to yellow, and bare except on the sixth segment. Hypopygium (fig. 79b) small, distinctly higher than long, without any projection; it is dull black and bears only a few scattered minute hairs on the lower half on each side. Anal tube darkened, short, and rather stout, terminal hairs weak.

FEMALE. Essentially like the male, except for the usual sexual differences. The scutellum has four subequal bristles.

Length: 1.3–1.7 mm.

Notation: *Megaselia koffleri* Schmitz should be compared with *Megaselia insulana* Brues. See Brues (1911, Ann. Mus. Nat. Hung. 9:542, and 1924, Psyche 31 (5):215). It is quite impossible to separate the two species from just their original descriptions. The type specimen of *M. insulana* was lost during the Hungarian revolution in Budapest, and it is not possible to decide at the present time whether or not these two are synonyms.

***Megaselia (Megaselia) longibarba* Beyer, new species (fig. 79c).**

This species is related to *M. heterodactyla*, *zebrina*, and, particularly, *curtubarba* n. spp., but differs distinctly from each as pointed out in the key. In Brues' key to the *Megaselia* of the Philippine Islands (see Brues, 1936:372) it runs to *reflexa* Brues and is distinguished from that species by having the thorax all black. In Brues' key to the *Megaselia* of Formosa (see Brues, 1924:209) it runs to *M. chipensis* Brues (see Brues, 1911:554), from which it is differentiated by its color. *M. longibarba* is also similar in many respects to *congrua* Schmitz from Formosa (see Schmitz, 1926:52), but *congrua* has the costa decidedly shorter (0.50, not 0.59) and the costal sections quite different. In Malloch's key to Samoan *Megaselia* (see Malloch, 1935:331) *longibarba* runs to couplet 5 and may be related to *perturbans* Malloch by having the fork of the radial vein large and the hind tibiae with the posterodorsal series of setulae reduced to very fine hairs; *M. perturbans* is, however, a yellow-colored species. *Megaselia setifemur* Bohart (see Bohart 1946:398), known only from Guam, is, as is true of most of Bohart's species, not sufficiently described. *M. setifemur* at least has the costal cilia longer than in *longibarba* but we cannot be sure of other details. Bohart (*loc. cit.*, p. 399) says of *M. setifemur*: "It runs close to *equiseta* Brues and *unisetosa* Brues in his key to the Philippine species (1936) . . ." This, however, is quite impossible, as *setifemur* has the halteres black, not yellow. Moreover, *equiseta* and *unisetosa* are not at all close together in Brues' key.

FEMALE. *Head*: Front distinctly wider than high, e.g., 0.340:0.272 mm.; its surface opaque gray pollinose, with a rather distinct brownish ground color. Ocellar triangle raised, deep black. Median furrow distinct. Fine hairs densely placed but inconspicuous. Four supra-antennals; the lower bristles are half as long as the upper ones and slightly closer together. The distance between the upper proclinate bristles is approximately 1.5 times greater than the distance between the preocellars; the upper proclimates and the preocellars are

separated by a distance equal to about two-elevenths of the width of the front. First row of four reclinate bristles slightly convex medially, the antials occupying more than one-half the frontal width (13:22), set a little lower than the upper postantennals, and distinctly farther from the median line than from the eye margin. Anterolateral bristles situated on a level with upper supra-antennals; second transverse row somewhat bowed downwardly, its bristles not quite equidistant, but the preocellars relatively a little farther from each other. Third antennal segment black, medium-sized, rounded, with a slight point at apex, and with short pubescence. Arista rather thickly pubescent, about twice as long as the height of the front (*in situ*). Palpi dark brown, not stout, of normal form and size; ventral margin with six bristles, the first and fourth being rather delicate, the other four are strong and of nearly equal length; the end bristle is not differentiated. *Thorax*: All black or very dark brown; mesonotum subshining. No bristly hairs are present between the dorsocentrals. Scutellum with two bristles. Mesopleura bare. *Legs*: Chiefly dark brown, including the coxae, with the tarsi lighter in color; the tibiae and tarsi of the front legs are yellowish. Front tibia 0.56 mm. long, basitarsus four-sevenths the length of the tibia (0.32 mm.); each tarsal segment distinctly longer than wide, the apical segment as long as the preceding one. Hind femora not stout, 1.22 mm. long, 0.29 mm. broad; basal half of ventral margin with small, densely placed cilia, becoming more distant distally. Tibia decidedly shorter than the femur (0.976 mm.); the cilia inside the dorsal hair seam are very numerous and fine. Ratios of tarsal segments 30:20:15:11:9. *Wings*: (fig. 79c). Infuscated, long and narrow, e.g., 2.45 mm. long, 0.91 mm. broad. Costal index 0.59, ratio of costal segments 32:31.5:19, thus one is approximately equal to two. Costal cilia very short, not much longer than the diameter of the costa, 0.097 mm.; 13 cilia are on the first section and 17 on sections two plus three. The cell formed by the radial vein is large and elongated, but not narrow or especially acute-angled; posterior branch of fork very long. Vein M_1 arising well beyond the fork, with a distinct, short S-curve at its base, arcuate medianly, nearly straight on the distal half, not recurved apically. Anal angle of wing undeveloped. Halteres black. *Abdomen*: All black, widest at segment two, tapering towards apex. Dorsal plates not shining. First tergum short, the second slightly elongated; none of the terga is reduced or otherwise modified. Plates one to four with short and sparse, but distinct hairs; these are longer on the hind margin of the fourth and much more conspicuous on the fifth tergum. Very long, thin hairs are present on the sides of plates five and six, as well as on the sides and along the hind margins of the postabdominal terga; these hairs, which are longer for instance than one of the abdominal segments, are not known in any other Pacific or Oriental species. The European *Megaselia* (*Meg.*) *villicauda* Schmitz (see Schmitz 1927:144) possesses similar hairs, but these are limited to the eighth sternum. Venter of the abdomen black, with a few scattered hairs. Terminalia brown, not horny.

Length: about 1.9 mm.

MALE. Unknown.

Holotype female: Kula Pipe Line, Maui, alt. 4,200 ft., July, 1956 (D. E. Hardy). One female paratype: Waikamoi, Maui, alt. 4,000 ft., July, 1956 (D. E. Hardy).

Type in the B. P. Bishop Museum collection. Paratype in the United States National Museum.

Megaselia (Megaselia) scalaris (Loew) (fig. 80a-c).

Phora scalaris Loew, 1866, Berl. Ent. Zeits. 10:53.

Phora xanthina Speiser, 1908, Berl. Ent. Zeits. 52:148.

Phora conjuncta Becker, 1908, Mitt. Zool. Mus. Berl. 4 (1):210.

Phora fissa Becker, 1908, Mitt. Zool. Mus. Berl. 4 (1):193.

Aphiochaeta circumsetosa de Meijere, 1911, Tijdschr. v. Ent., 54:348.

Aphiochaeta ferruginea Brunetti, 1912, Rec. Ind. Mus. 7:83.

Aphiochaeta repicta Schmitz, 1914, Jaarb. Natuurh. Genootsch. Limburg, p. 108.

Obelosia plusiivorax Enderlein, 1929, Wien. Ent. Ztg. 46:104.

Widespread over all the islands which have been investigated.

Immigrant. Almost cosmopolitan, apparently found throughout the world, except in northern regions.

Location of type: Museum of Comparative Zoology, Cambridge, Massachusetts, according to Schmitz (1929:25).

This species is distinguished from other *Megaselia* in Hawaii by the predominantly yellow coloration and average larger size. The head characters are as in figure 80a. The upper postantennal bristles are two times farther apart than are the lower bristles. The thorax is entirely yellow. The mesopleura are bare. The mesonotum is densely covered with short, black, appressed setae. The wings are as in figure 80b. The legs are yellow, except for a black spot at apex of each middle and hind femur. The front and middle tibiae have a row of closely placed black hairs extending down the dorsal surface. The hind and front tibiae also have a row of about twelve, evenly spaced, short bristles extending down the anterodorsal surface; the middle tibiae have two rows of short bristles, one on each side of the dorsal hair seam. The abdominal terga are chiefly black on the sides and yellow in the median portions. The color pattern of the abdomen and the remainder of the body varies considerably in this species. The anal tube of the male has very strong terminal bristles (fig. 80c).

The species is extremely variable in size, ranging from 1.5–3.5 mm. in length.

M. scalaris has been recorded breeding in all sorts of decaying organic matter, from gangrenous wounds in cattle and other animals including humans to various plant and animal humus. It has even been found breeding in formalin-preserved toads in the zoology stock room at the University of Hawaii.

Notation: *M. scalaris* should be compared with *M. pseudoscalaris* (Senior-White) (1924:399, *Aphiochaeta*). This Ceylonese species, which was described from a unique female, is supposed to differ from *scalaris* by having two bristles on the scutellum and by having four strong infra-ocular bristles. The anterior

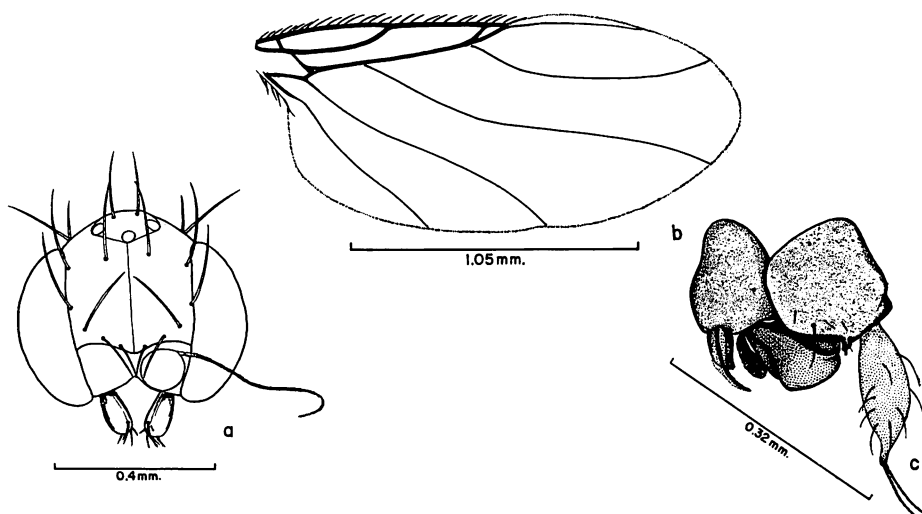


Figure 80—*Megaselia* (*Megaselia*) *scalaris* (Loew): a, head; b, wing; c, male hypopygium.

pair of scutellars is, however, sometimes very weakly developed, and, in a few cases, there are three or four strong bristles at the lower edge of the eye.

***Megaselia* (*Megaselia*) *zebrina* Beyer, new species (fig. 81a–b).**

The female of this species is readily differentiated from any Pacific or Oriental species by having the fourth abdominal segment all white; in this respect, it resembles the European *Megaselia* (*Megaselia*) *zonata* (Zetterstedt), to which it is closely allied. *M. zonata*, however, has the halteres yellow, the costal cilia long, and the third abdominal tergum normal.

FEMALE. Very similar to *M. heterodactyla* n. sp., differing in the following respects: *Head*: Front but a little broader than high and entirely opaque. *Legs*: Predominantly yellow, much lighter than in *heterodactyla*. Hind femora yellowish brown, middle and hind coxae dark colored. *Wings*: (fig. 81a) 1.528 mm. long and 0.864 mm. wide. Costal index 0.51–0.52, thus much shorter than in *heterodactyla*. Ratio of costal segments roughly 5:3:2. Fork of radial vein distinctly smaller, the anterior branch (R_{2+3}) being much shorter. Vein M_1 with a slight S-curve at the beginning; this is obsolete in all specimens of *heterodactyla* which have been examined. Vein M_1 not noticeably recurved on the distal fifth or sixth. *Abdomen*: Terga one and two normally developed and black. Tergum three (see fig. 81b) reduced in size, much shorter and narrower than the second plate, and predominantly black; venter and side margins of segment three white. Segment four all white, the tergum membranous, but covered with a few scattered hairs. Lundbeck, in his key to the European *Megaselia* (1922:228), says of *zonata* “fourth abdominal tergite quite unchitinized”; this, however, is evidently a mis-

take because in *zonata* the fourth tergum is fully sclerotized. Segments five and six of *zebrina* dark with the terga formed as in *heterodactyla*.

Length: 1.8–2.0 mm.

MALE. Unknown. The abdomen will undoubtedly be all black.

Holotype female: Konahuanui Trail, Oahu, August, 1953 (D. E. Hardy).
One female paratype: Waipoo Falls, Kauai, August, 1953 (D. E. Hardy).

Type in the B. P. Bishop Museum. Paratype in the United States National Museum.

Megaselia (Megaselia) species No. 1.

A single male specimen of an apparently new *Megaselia* closely allied to *Megaselia koffleri* Schmitz is present; it is distinguished, however, by the much darker halteres and legs, by the weaker posterodorsal cilia of the hind legs, and by the rather thickly pubescent arista.

The specimen is from Upper Olaa Forest, Hawaii, alt. 4,000 ft., July, 1956, (D. E. Hardy).

Megaselia (Megaselia) species No. 2.

Three males are present which are very similar to *M. heterodactyla* n. sp. but which differ in having the tarsi of the front legs much more slender and the fifth tarsal segment not enlarged. They may possibly belong to *M. zebrina* n. sp., but in view of the paucity of material it is not possible to draw any definite conclusion about this.

One male: Hawaii National Park, Hawaii, alt. 4,000 ft., March, 1946 (W. W. Wirth); one male: Napau Crater, Hawaii, July, 1956 (D. E. Hardy); and one male: Ewa, Oahu, June, 1955, at light (J. W. Beardsley).

One specimen has been returned to the United States National Museum, one is in the Hawaiian Sugar Planters' Association collection, and one is in the collection at the University of Hawaii.

Genus METOPINA Macquart

Metopina Macquart, 1845, Hist. Nat. Dipt. 2:666.

Leptophora Six, 1878, Tijdschr. v. Ent. 21:186.

Drepanophora Strobl, 1880, Progr. Seitenstetten 14:40, nec Loew, 1869.

Comfurcula Schmitz, 1927, Natuurh. Maandbl. 16:23.

Minute species. Front with 12 reclinate frontals arranged in two transverse rows of 6, 4, 2 bristles, anterolaterals always lacking; thus the frontal chaetotaxy is similar to that of *Puliciphora*. Both sexes have two pairs of proclinate supra-antennals. Ocellar tubercle raised and clearly defined. Fine hairs of front con-

finned to the median furrow which is always distinct. Third antennal segment rounded; arista plumose, apical or subapical in position. Palpi clavate, sometimes large, if so, the bristles of the ventral margin are weakly developed. The thorax is considerably elongate and arched, with one pair of dorsocentrals. Scutellum usually with two bristles (sometimes the anterior hairs are rather large in the female). The mesopleura are bare. Legs not stout, hind basitarsi sometimes large (e.g., in *ventralis* Schmitz). Hind femora of male with a characteristic sense organ on the inner side in a few species. Hind tibiae without dorsal hair seams, posterodorsal setulae always lacking. Wings slightly gray, never strongly infuscated; fully developed in both sexes, usually a little stouter in the males than in the females. Costa long, rarely thickened (viz., *M. crassinervis* Schmitz, male, and *M. pileata* Schmitz, female); cilia very short. Subcosta always present, but rather obsolete in *ventralis*. Radial vein mostly simple, but forked in *M. furcans* Schmitz from Costa Rica. Vein M_1 is straight except at apex. Vein M_2 is bent downward and vein M_{3+4} bent upward so that cell M_2 is hourglass-shaped (fig. 81c). This venation is rather similar to that of the African genus *Penthapplus* Schmitz (see Schmitz, 1958b:35); the females of *Penthapplus* are, however, apterous. Halteres present. Abdomen of both sexes with six terga. In the female a semicircular flap is present (like that found in *Puliciphora* and many related genera) at the base of the fifth tergum; the rest of the tergum is greatly reduced in size, occupying but a small portion of the fifth abdominal segment. In the male the venter bears a secondary sclerotized plate, the form of which is peculiar to each species. The hypopygium is small, the hind corners of the epandrium are not conspicuously protruded, and bristles are lacking in all known species. Anal tube rather small, stout; end hairs not very distinct.

The larval stages of *Metopina* have not been described, but Schmitz succeeded in breeding one of the European species on decaying meat. One European species (*M. formicomendicula* Schmitz) is myrmecophilous; the imago of that species elicits its nourishment from workers of the ant *Solenopsis fugax* Latreille (see Schmitz, 1927a:242).

Up to 1958, 17 species of the genus *Metopina* have been described, two of which are synonyms. The genus is known from Europe (11 species), from the Neotropics (3 species), and from the Bismarck Archipelago and Hawaii (1 sp.). *M. galeata* (Haliday), originally described from Europe, has been recorded also from North America, but this is probably an error. Hennig (1941:90) mentioned one undescribed species from Formosa. One new species from Madagascar will soon be described by the junior author.

Type of the genus: *Phora galeata* Haliday.

***Metopina ventralis* Schmitz (fig. 81c-d).**

Metopina ventralis Schmitz, 1927, Zool. Anz. 74 (11/12):245.

Oahu: Two females from Honolulu, June, 1953, and August, 1955 (R. C. Joyce); and Ewa, at light, September, 1955, (J. W. Beardsley).

Immigrant: Previously known only from the Bismarck Archipelago.

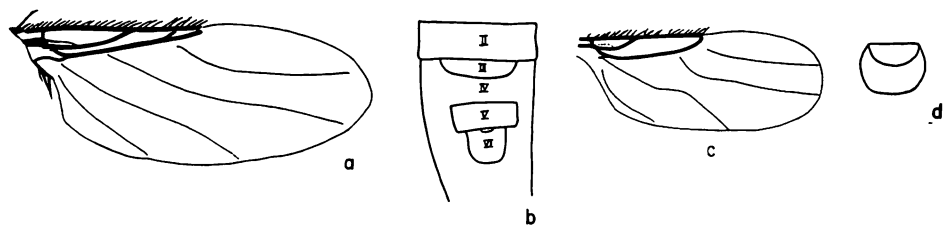


Figure 81—*Megaselia (Megaselia) zebrina* Beyer n. sp.: a, *wing; b, *abdominal terga two to six (diagrammatic, drawn from dry specimen). *Metopina ventralis* Schmitz: c, *wing; d, *fifth tergum. (* Drawn by Erwin Beyer, Bad Godesberg, Germany; no scale indicated.)

Location of the type series: Museum of Natural History, Berlin (type specimen probably not yet selected).

M. ventralis is readily distinguished from other related species by the structure of the fifth tergum of the female and by the shape of the ventral plate of the abdomen of the male.

Male specimens have not been seen from Hawaii. For a thorough description of this sex refer to Schmitz (1927a:245).

FEMALE. Front about as broad as high, scarcely produced anteriorly, its surface dark-brown or gray-black, sometimes subshining. Ocellar tubercle well defined, deep black. Median impressed line distinct. Fine hairs of front not especially dense. Two pairs of equal-sized supra-antennals present; the lower are noticeably closer together than the upper bristles, 0.070 mm. long. Lower postantennal, antial, and mediolateral bristles are situated in one oblique row; the antials are considerably farther from the lower postantennals than from the mediolaterals, which are placed some distance from the eye. Palpi bright yellow, medium-sized, and slightly flattened; ventral margin with four to five weak bristles arranged in two rows; end bristle not differentiated. Length of each palpus 0.093 mm., width 0.030 mm. Third antennal joint brown, rounded with a slight point at apex, and slightly longer than broad (0.073; 0.067 mm). Arista plumose and apical in position. Thorax black; the two dorsocentrals, as well as the other bristles of the mesonotum are small. Scutellum with two bristles. Mesopleura bare. Anterior pair of legs including the coxae, light yellow, middle and hind legs darker, especially the coxae and the hind femora. Front tibia 0.243 mm. long; middle leg: femur 0.151 mm., tibia 0.117 mm., basitarsis 0.0416 mm.; hind leg: tibia 0.174 mm., basitarsus stout, 0.0896 mm. long, with four comb-like transverse rows of minute hairs on the inside surface. Wings slightly tinged with gray. In one specimen the wings are 1.104 mm. long and 0.0496 mm. broad. Costa not broadened, reaching to the middle of the wing (index *ca.* 0.49–0.5). Ratio of costal segments 13:22. Costal cilia short, 0.038 mm. long, about 10 situated on section one and 13 on section two. Vein M_1 not curved upward apically, subparallel to vein M_2 (fig. 81c) (distance 0.118 mm.). Shortest distance between veins M_2 and M_{3+4} , 0.086 mm. Halteres black. Abdomen with six dark-colored

terga covered with extremely minute scattered hairs. Terga one to three of normal size, four to six are reduced in width, becoming gradually smaller toward the apex of the abdomen. Fourth tergum trapezium-shaped, its anterior width 0.026 mm., hind corners a little rounded. The flap at base of the fifth tergum (see fig. 81d) as long and as broad as the remainder of the tergum. In dried specimens the fifth tergum appears to cover the whole segment and the flap seems very small. Sixth tergum greatly reduced, tiny, longer than broad. The median portions of the venter are continuously hairy from the second to sixth segment.

Length: 1.0–1.2 mm.

Genus **PULICIPHORA** Dahl

Puliciphora Dahl, 1897, Zool. Anz. 20:409.

Stethopathus Wandolleck, 1898, Zool. Jahrb. Abth. f. Syst., p. 424.

? *Pachyneurella* Brues, 1903, Trans. Amer. Ent. Soc. 29:382.

Myrmomyia Silvestri, 1911, Boll. Lab. Zool. Gen. & Agr., Portici 5:175.

Termitophora Schmitz, 1913, Ent. Medd. 10:9.

Parapuliciphora Santos, 1921, Mem. Acad. Barcelona (3) 17:73.

MALE. Front with two pairs of porrect, proclinate supra-antennals and 12 reclinate bristles arranged in the following manner: an upper row of six along the vertex (Silva, 1916:14, is probably wrong in drawing but four bristles along the hind margin of the front of his Chilean *P. rufipes*); a middle row of four bristles, containing the preocellars and mediolaterals; and a lower row of two bristles (antials); the anterolateral bristles are, as in some related genera, always lacking; see *Metopina* Macquart. Median impressed line sometimes obsolete (viz., in *wymani* Bohart). Ocellar triangle distinct, fine hairs of front confined to the median furrow. Third antennal segment round, arista plumose, dorsal in position. Palpi normal in *Puliciphora s. str.* and *Cryptopteromyia s. pr.*, whereas large palpi are peculiar to the subgenus *Termitometoecus*. Mouthparts inconspicuous, not heavily sclerotized. Thorax normal, humped, not reduced in size; mesopleura bare; scutellum with two to four bristles. Hind tibiae without dorsal hair seams; sometimes a series of posterodorsal cilia may be faintly developed (as in *wymani*). Hind legs rarely with the basitarsi conspicuously stout. Wings fully developed, more or less hyaline (smoky in *Chonocephalus*). Costal cilia very short, arranged in two rows. Anterior branch of radial fork always lacking, thus the radial sector is never forked. Subcosta distinct. Veins M_2 and M_{3+4} slightly bent, not strongly curved together; the anal angle is, contrary to the African genus *Penthaplus* Schmitz, well developed. Alular region without bristles. Halteres present, of normal size. Abdomen with six terga; hypopygium without bristles, except in some species of *Termitometoecus* and in the North American *P. venata* (Aldrich), the subgeneric position of which is problematic.

FEMALE. The females differ strikingly from the males by having the wings greatly reduced or absent. The front is just slightly produced anteriorly, not

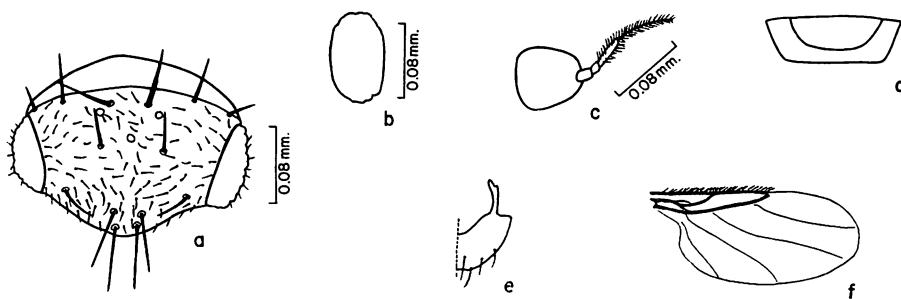


Figure 82—*Puliciphora wymani* Bohart: a, *head; b, *outline of female eye; c, *antenna of female; d, *fifth tergum of female; e, *sixth tergum of female, right half; f, *wing. (* Drawn by Erwin Beyer, Bad Godesberg, German; no scale indicated.)

pointed as in *Chonocephalus*; two pairs of porrect supra-antennals and three to six pairs of reclinate bristles are present. The compound eyes are rather small, the number of facets varying in different species. Ocellar tubercle wanting, not elevated; three ocelli always present (absent in the Australian genus *Neopuliciphora* Schmitz and Mjoberg, and in *Stethopathusa* Schmitz, from Sumatra). Third antennal joint rounded, more or less oval, never conical as in *Stethopathusa* Schmitz; arista dorsally inserted and thickly pubescent. Proboscis inconspicuous. A series of bristly hairs is always present between the upper margin of the antennal groove and the lower edge of the eye. The thorax is reduced, much shortened and with a row of four or six bristles along the hind margin. Scutellum lacking. Wings are absent in *Termitometoecus* and are developed as a microscopic papilla with a characteristic bristle in *Puliciphora* s. str., whereas in *Cryptopteromyia* the wing vestige is much more prominent. No trace of halteres is present. Legs like those of the male. The abdomen is not depressed as in *Chonocephalus* and with five or six terga. The first tergum is extremely short, sometimes seemingly connected with the following sclerite; this is always very large, the longest of all the terga. Fifth tergum with a semicircular flap covering a gland sac. The otherwise closely related genus *Penthapilus* Schmitz (see Schmitz, 1958:35) has no trace of such a structure. The sixth tergum is membranous in a few cases (viz., *pallicauda* Schmitz, *trisclerita* Senior-White), usually, however, it is developed into a small sclerite which is produced anteriorly into two sclerotized apodemes; these endoskeletal structures are very rarely reduced (e.g., in *calva* Schmitz). The sixth abdominal plate is sometimes longer and larger, scarcely reduced (e.g., in *velicipes* Schmitz).

Thirty-seven species of *Puliciphora* had been described up to the end of 1958; at least two of these are synonyms, and the generic position of four (*glacialis*, *nitida*, *palposa*, and *myrmecophila*) is doubtful. The genus is now divided into three subgenera, viz., *Cryptopteromyia* Tragardh (confined to south Africa), *Termitometoecus* Borgmeier and Schmitz (America), and *Puliciphora* Dahl s. str. The latter is distributed all over the world, except for Europe.

Some species are known to beinquilines in nests of ants and termites; most, however, are free living. The inquiline species are morphologically not particularly adapted to a life in a social system. The problems to be derived from this fact are very thoroughly discussed by Seevers (1941), but in view of the very limited and sparse ecological data available any discussion of these problems at the present time has to be theoretical.

The free-living species are known to be scavengers breeding on vegetable matter and animal products. The larval stages of some species have been described by de Meijere (1912).

Type of the genus: *Puliciphora lucifera* Dahl.

KEY TO KNOWN SPECIES OF PULICIPHORA IN HAWAII

- | | | |
|----|---------------------------------|-----------------------|
| 1. | Males | 2 |
| | Females | 3 |
| 2. | Two scutellar bristles | <i>lucifera</i> Dahl. |
| | Four scutellar bristles | <i>wymani</i> Bohart. |
| 3. | Ten frontal bristles | <i>lucifera</i> Dahl. |
| | Fourteen frontal bristles | <i>wymani</i> Bohart. |

***Puliciphora (Puliciphora) lucifera* Dahl.**

Puliciphora lucifera Dahl, 1897, Zool. Anz., 20:410.

Oahu, probably common on all the main islands. Specimens have been taken at light, on windows, and have been bred from a variety of decaying plant and animal materials. This is a new record for Hawaii.

Immigrant. Bismarck Archipelago (type locality), Fiji (recorded by Brues), and Samoa (recorded by Malloch).

Location of type: Museum of Natural History, Berlin.

P. lucifera was adequately redescribed by Schmitz (1929b:114) and only the diagnostic characters which distinguish it from the other Hawaiian *Puliciphora*, viz., *wymani* Bohart, are given below:

FEMALE. Front with only ten bristles, viz., four proclinate supra-antennals and a series of six reclinate frontals along the vertex. The posterior margin of the mesonotum bears six bristles (four in *wymani*). The first tergum of the abdomen is connected with the second. The third tergum is much shorter than the second. The semicircular flap of the fifth tergum is half as long as the whole segment, in *wymani* the flap is much longer. The form of the sixth segment is quite different, its apodemes are much stouter than in *wymani*.

MALE. The male has only two scutellar bristles. The wings are similar in both species. The hypopygium is noticeably smaller in *lucifera*; when seen from the side it is slightly higher than long and the hind corners are not produced. Anal tube short and dark colored.

Puliciphora (Puliciphora) wymani Bohart (fig. 82a-f).

Puliciphora wymani Bohart, 1947, Proc. U. S. Nat. Mus. 96 (3205):411.

Oahu. A very common scavenger species, probably common on all the islands. Immigrant. Guam.

Location of type: United States National Museum.

P. wymani is related to *tokyoensis* (see Kinoshita, 1918:402); the female is, however, distinguished from that species by the different structure of the last two preabdominal terga; the male is distinguished by having four scutellar bristles (two in *tokyoensis*).

FEMALE. Width of head: 0.224 mm. Front (fig. 82a) subshining brownish yellow, sometimes with darker markings; in dried specimens the front is apparently longer than wide, after maceration in lactic acid, however, it becomes evident that this is due to shrinkage. Ocellar tubercle absent; the three ocelli are situated in a more or less rectangular triangle, all are of equal diameter. Distance between the two upper ocelli 0.0576 mm., between the posterior and the anterior ocelli the distance is 0.035 mm. The fine hairs of the front are rather densely placed (refer to fig. 9 in Schmitz, 1958:30, front of *sedecimsetarum* Schmitz), length 0.016 mm. Median furrow lacking. The front bears 14 bristles; two pairs of proclinate, porrect supra-antennals, which are always present in both sexes of *Puliciphora*; these four bristles are of equal length (0.064 mm.), the lower ones are parallel, separated by 0.0224 mm., the upper bristles are divergent, a little farther from each other than are the lower bristles (0.0288 mm.). The antial bristles are convergent. The preocellars are noticeably farther from each other than the posterior ocelli (0.064 mm.); they are 0.038 mm. long. Third transverse row with six bristles, the ocellars are the longest (0.064 mm.), and the outer postlaterals are the shortest. The inner lateral bristle is a little nearer to the outer than to the ocellar bristle, the distances between the outer postlateral bristle, the inner bristle, and the ocellar bristle being 0.030:0.045:0.035 mm. Eyes hairy and black, thus contrasting with the remainder of the head; their shape is suboval, but the sides are more or less parallel (see fig. 82b); length 0.0896 mm., width 0.0528 mm. The compound eyes contain about 54 facets arranged in six rows of seven to nine facets each. Ommatidial cornea hemispherically produced. On each side of the head is a series of four bristles between the upper margin of the antennal impression and the lower edge of the eye; these bristles become longer toward the eye, the longest being 0.038 mm. Third antennal segment (fig. 82c) yellowish, not much longer than wide (0.062:0.060 mm.). Arista 0.224 mm. long, very thickly pubescent. Palpi bright yellow, normal in shape and somewhat clavate; without basal stipes each measures 0.0896 mm. long. Ventral margin of each palpus with some hairs and five or six bristles, about four of which are of nearly equal length (0.059 mm.); the end bristle is not differentiated. The thorax is yellowish to rufous; hind margin of mesonotum with four bristles. In addition to these another bristle is present at each corner of the mesonotum, representing the extremely reduced wing rudiment; it is 0.1 mm. long. The

mesopleura are entirely bare, halteres are absent and the scutellum is lacking. The legs are yellow. The hind tibiae are flattened with the posterodorsal cilia distinctly longer than the other setulae. The hind metatarsi are stout (like those of *tokyoensis*); the comparative lengths of hind tibiae and metatarsi are 73:47 mm. The abdomen is widest at the end of the second segment (0.529 mm.) and has six tergal plates. Terga dark opaque brown, densely haired, and with the hairs along the posterior margin noticeably longer than the other hairs. First tergum very short, visible only as a transverse stripe which is not connected with the following tergum; minute hairs arranged in a single row except near the apex. The lengths of terga two to six are as follows: 0.240:0.128:0.125:0.118:0.0256 mm. The semicircular flap of the fifth tergum (fig. 82d) is 0.080 mm. long, thus relatively large (the comparative lengths of the whole tergum and the flap are 32:25). Anterior width of the fifth tergum 0.372 mm., that of the flap 0.195 mm. (about 17:12). Sixth tergum (fig. 82e) lunulate; the tips of its apodemes are separated by 0.090 mm. Abdominal segments five and six continuously ringed with tiny setae, arising from minute sclerotized plates which are brown in color. The segments anterior to the fifth are haired dorsolaterally and ventrally.

MALE. In addition to the ten reclinate frontals of the female one pair of mediolateral bristles are present; these are set on a noticeably lower level with the preocellars. The eyes are not reduced and are much larger than in the female. The thorax is fully developed and humped, dark colored above, lighter on the sides. Scutellum with four subequal bristles. The legs are much like those of the female. The wings (fig. 82f) are not infuscated, and are 1.123 mm. long by 0.576 mm. wide; costal index 0.55–0.56. The cilia are extremely short, 0.035 mm. long. Knobs of halteres pale brown to dark brown. The abdomen has six clearly defined tergal plates, none of which is reduced. The first is short, but not extremely short like that of the female. Each tergum is clothed with very short, inconspicuous hairs. The venter is light yellow. The hypopygium is medium-sized, dark opaque brown to grayish, without any bristles but covered with a few very tiny hairs. When seen from the side the epandrium is much higher than long; its hind corners are slightly produced. The anal tube is light yellow, 0.128 mm. long, much longer than high (10:3), and the end hairs are not longer than the others and are set at some distance from the tip of the anal tube.

Length (taken from dried specimens) of male: 0.8–1.0 mm.; of female: 0.9–1.1 mm.

Genus **CHONOCEPHALUS** Wandolleck

Chonocephalus Wandolleck, 1898, Zool. Jahrb. Syst. 11:428.

Heterophora Santos, 1921, Mem. Acad. Barcelona 17 (1):81.

Schmitz, dealing with species of the Bismarck Archipelago, has given a thorough description of the genus (1929:168), so it will suffice herein to point out the chief characters which distinguish it from other Metopininae.

MALE. Head strongly pointed; front with a distinct median furrow; ocellar tubercle and three ocelli present. Only four reclinate frontal bristles present; these are arranged along the hind margin. Supra-antennals lacking, lower and upper margin of the antennal cavities with a series of rather delicate bristles. Third antennal segment rounded, slightly acute at apex. The arista is apical in position. The mesopleura are hairy and four scutellar bristles are present. Hind tibiae without dorsal hair seams and posterodorsal setulae and the hind tarsi are stout. Wings are fully developed; the venation is as follows: the humeral cross-vein is absent; vein R_1 is atrophied and evanesces before reaching the wing margin; the subcosta is rudimentary; the radial vein is simple, not bifurcate, and has a peculiar bulla at tip; the base of vein M_1 is lacking (fig. 83d). Alular margin without bristles. Halteres present. Abdomen with six fully sclerotized, weakly haired terga covering the dorsum. Hypopygium with the anal tube greatly reduced in size, not at all protruding.

FEMALE. Very degenerate. Median furrow and ocelli entirely absent and the compound eyes small. Shape of front as shown in figure 83e. True frontal bristles are always lacking, but sometimes the ocellar setae are distinguishable from the fine hairs (e.g., in *C. elongatus* Schmitz). Upper and lower margin of the antennal grooves bristled as in the male. The thorax is extremely short, the humeral corners are conspicuously marked off as rounded protuberances. The legs are similar to those of the male. Wings are absent; in contrast with *Puliciphora* females there is no trace of a wing vestige. Correlated with the apterous condition the halteres are also lacking. The dorsum of the abdomen is fully covered by six terga. The sixth segment has a ventral plate which is common to all species. The seventh segment has a ventral spatula-shaped structure.

Including the new species described below, 26 named species are now known. It is probable, however, that some of these are synonyms. Often the sexes have been described as separate species and it is impossible to associate the sexes in museum specimens.

The genus *Chonocephalus* is very distinct from any other Metopininae, except probably for *Epichonocephalus* Schmitz. This latter genus is monotypic and the females are not yet known, so at present it is not possible to be sure of its correct position. The head details are similar in both; *Chonocephalus* differs, however, in not possessing the ventral hook on the hind femur which is peculiar to *Epichonocephalus*; moreover the venation at the base of the wing is quite different. Both of these genera probably form an evolutionary side branch; the details of the pleura and legs indicate, however, that both genera probably fit in the Metopininae.

The species are probably all scavengers living in rotting plant and animal materials. Malloch (1935:339) reported *C. dorsalis* Wandolleck reared from fowl dung in Samoa. Bohart (1947:410) and Brues (1919:49) recorded it from dead snails in Fiji. Bohart and Gressitt (1951:79) reported that *C. hirsutus* Bohart was collected on pig dung on Guam and that specimens of *C. subglaber* Bohart were found abundantly on decaying woody materials and fruit and are very common

in the leaf axils of dead pandanus, in the rotting stumps of papaya, and in decaying breadfruit. They also reported that these flies have been observed to feed on fruiting bodies of fungi and stated that they probably feed largely on fungi which occur in rotting humus. Some species are known to be termitophilous or myrmecophilous (e.g., *C. ecitophilus* Borgmeier and Schmitz) ; as in *Puliciphora*, such species are not at all adapted morphologically for a life in a social system.

Two Hawaiian species have been recognized to date; these are abundant on rotting breadfruit and vegetable humus.

Type of the genus: *Chonocephalus dorsalis* Wandolleck.

KEY TO THE KNOWN SPECIES OF HAWAIIAN CHONOCEPHALUS

- 1. Males2
 Females3

- 2. Lower margin of the hypopygium with two processes,
 the posterior lobe is very short and the anterior
 lobe is much larger and longer. **pallidulus** Beyer, n. sp.
 Lower margin of the hypopygium without such pro-
 cesses..... **simiolus** Beyer, n. sp.

- 3. Third abdominal tergum slightly longer than the
 second; transverse stripes of the abdominal terga
 very dark, contrasting in color with the remaining
 portions of the terga..... **simiolus** Beyer, n. sp.
 Second abdominal tergum longer than the third;
 transverse stripes of terga one to five rather pale,
 not so conspicuously darker than the remaining
 portions of the terga **pallidulus** Beyer, n. sp.

Chonocephalus pallidulus Beyer, new species (fig. 83a-c).

The female of *C. pallidulus* appears to be similar in most respects to *C. hirsutus* Bohart from Guam and because of the very brief, inadequate, description of *hirsutus* it is not possible at present to distinguish the two species from the females alone; the male genitalia are, however, quite different in structure and chaetotaxy.

MALE. Halteres and preabdomen dark brown to black; thorax and legs yellowish; hypopygium brownish. *Head*: Bristles as in *C. dahli* Schmitz. Antennae moderate in size, third segment a little higher than wide (0.076:0.061 mm.). Palpi of normal size, 0.086 mm. long by 0.038 mm. broad; terminal bristle strongly differentiated, 0.026 mm. long. *Thorax*: Mesopleura with two to four small

hairs. Scutellum with four bristles, the posterior pair moderately spaced. *Wings*: Broadest before apex of costa (width: 0.050 mm.). Costal index 0.63. Vein R_1 atrophied apically, not reaching the wing margin. Wings distinctly infuscated, the dark fumosity is much less distinct in dried specimens. Vein M_1 concave and M_2 straight or nearly so. *Abdomen*: Sixth abdominal tergum about twice as long as the preceding segment. Hypopygium with two processes on the lower margin of the left side; the posterior process is very small and short; the anterior one is much larger, conspicuously protruding, and obliquely truncate apically (fig. 83b). Along the lower margin a series of about eight long hairs are present; these are all of equal length and are not bristle-like. Also the lower margin of the right side has a series of about seven similar hairs arranged in one regular row; some of the hairs on the posterior portion are slightly displaced. The right side of the hypopygium lacks any prominent processes. Anal tube rather reduced. The ventrite is entirely wanting. The cerci are rounded, with five short hairs.

Length: body, 1.20–1.30 mm.; wings, 1.04 mm.

FEMALE. Rather pale yellow. The eyes are black, contrasting with the remainder of the head. Abdominal terga one to five with narrow brownish transverse stripes anterior to the transparent hind margins. *Head*: Width of head, including the eyes, 0.256 mm.; length of front 0.182 mm.; width of front, on the level of the hind bristles of the upper margin of the antennal grooves, 0.160 mm.; anterior width of front 0.112 mm. When seen from the side (fig. 83a) the head is about one-third longer than high (0.182:0.133 mm.). Ocellar bristles reduced to delicate hairs about 0.027 mm. in length; these are, however, fairly distinct and well differentiated from the fine hairs of the front. Compound eyes rather oval in shape, 0.050 mm. long and 0.032 mm. wide; about 16 facets are present (in *hirsutus* only 12); the series of bristles along the upper margin of the antennal cavities consisting of four bristles each, these rather widely spaced, whereas the five bristles of the series below the antennal groove are more closely placed: the hind bristle of the former series is 0.090 mm. long and that of the latter series is 0.086 mm. Palpus, excluding the basal stipes, 0.083 mm. long and 0.022 mm. wide, thus moderate-sized; end bristle distinct, 0.061 mm. long. Third antennal joint rounded, about as high as broad (0.048:0.045 mm.); arista plumose, about 0.220 mm. long. *Thorax*: Hind margin concave, but on the whole the mesonotum is but moderately constricted; the median length is five times shorter than the anterior width (0.043:0.0224 mm.); lateral length 0.083 mm. Dorsum of thorax not so densely hairy as the front. *Legs*: Front tarsus 0.186 mm. long; relative length of tarsal segments as follows: 20:9:8:8:11 (the last excluding claws and pulvilli). Both mid and hind femur with a short end spur. Hind tarsus 0.272 mm. long, hind metatarsus slightly longer than the following three segments (0.112 mm.). *Abdomen*: 0.590 mm. long and 0.370 mm. wide, but rather variable. Relative length of terga one to five as follows: 46:20:18:19:20.5, or 0.131:0.064:0.058:0.061:0.066 mm. The sixth tergum measures 0.128 mm. in length; it may actually be a little longer since it was somewhat arched in the specimen from which the measurement was taken. The hyaline hind border is narrow, one-fifth

the length of the whole tergum, not broader than the dark brown stripe in front of it; this is not so conspicuous as in *simiolus* n. sp. The last transverse row of fine hairs on terga one to five are situated in elliptical dots (length 0.019 mm.); these hairs are slightly longer than the remaining fine hairs (0.030 mm. instead of 0.022 mm.). Sixth sternum formed as shown in figure 83c. Spatula-shaped structure of seventh segment as in *C. simiolus* n. sp.

Length: body, 0.8–1.0 mm. (from specimens preserved in alcohol).

Holotype male: Honolulu, Oahu, October 30, 1952 (C. R. Joyce). Allotype female: same locality and collector, June 30, 1952.

Holotype male and allotype female in the Bernice P. Bishop Museum.

Chonocephalus simiolus Beyer, new species (fig. 83d–f).

In both sexes rather similar to *C. punctifascia* Borgmeier from Brazil; the male of the latter is, however, differentiated by the straight vein M_1 and the female is separated by the details of the head and thorax. The female apparently is very similar to *subglaber* Bohart (1947:410), and at present it is not possible to distinguish the females of these species; the male genital characters show, however, that *simiolus* is quite a different species. Bohart (*loc. cit.*) says, in dealing with his *subglaber*: "it is almost identical with *buccalis* Malloch (*sic! recte buccata*)." This is obviously an error, since *buccata* belongs in a group characterized by not having transparent dots on the submarginal transverse stripes of the first five terga.

MALE. Fitting very near *pallidulus* n. sp., but with the following structural differences: Wing (fig. 83d) 1.28 mm. long and widest at the top of the costa (0.61 mm.). Costal index 0.59–0.60. Hypopygium (fig. 83f): left side without processes on the lower margin; in addition to the series of about twelve very long hairs, which are not at all bristle-like, and which stand in an almost regular row, there are a few much shorter hairs situated nearer the lower margin. On the right side are five to seven longer hairs and many small delicate hairs; these are irregularly arranged, so that no true rows are distinguishable. All hairs are curved apically.

FEMALE. Head and appendages, thorax, and legs pale yellow, contrasting with the dark-colored abdomen. Abdominal terga one to five each with a brownish black stripe immediately in front of the narrow, hyaline hind border. Head: (fig. 83e). The width is 1.3–1.5 times greater than the length of the front (e.g., 39:29 or 0.280:0.186 mm.); on a level of the antennal grooves the front is but slightly narrower than half the greatest width of the head, including the eyes. Compound eyes distinctly longer than broad, oval in shape and containing about 14–16 facets. Surface of front with the fine hairs minute; in contrast with *C. elongatus* Schmitz and *depressus* de Meijere, these are as densely placed as the fine hairs on the mesonotum. No bristles are developed along the vertex. Upper antennal margin with five bristles, lower margin with about four bristles; these are distinctly shorter toward the anterior portion of the front; the hind bristle

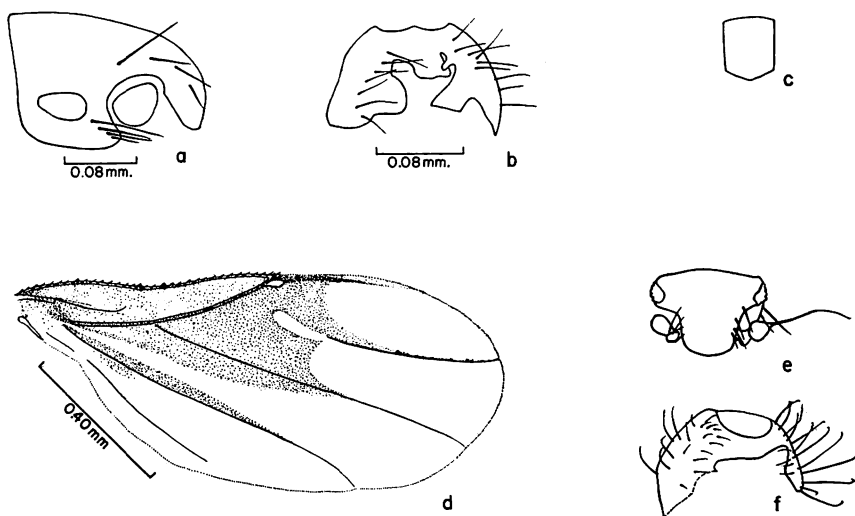


Figure 83—*Chonocephalus pallidulus* Beyer, n. sp.: a, *head of female, right side (palpi and mouthparts left off); b, *hypopygium (dorsal anal tube left off); c, *sixth sternum of female. *C. simiolus* Beyer n. sp.: d, wing; e, *female head, dorsal; f, *male hypopygium, from below (anal tube left off). (* Drawn by Erwin Beyer, Bad Godesberg, Germany; no scale indicated.)

of the upper row measures 0.070 mm., and the hind bristle of the lower row is 0.090 mm. long. Palpus clavate, excluding the basal stipes it is 0.086 mm. long by 0.050 mm. wide and has some delicate hairs and one distinct end bristle which is nearly as long as the whole palpus (0.080 mm.). Third antennal segment rounded, about as long as broad (e.g., 0.050 mm.). *Thorax*: Shaped as in *pallidulus*, constricted medially, but not especially narrow; the proportion of anterior width and median length are 39:9, e.g., 0.224:0.061 mm. *Abdomen*: Rather oval in form but, as usual, varying somewhat in shape. The relative lengths of terga one to six are as follows: 35:27:28:27:47, or 0.112:0.0864:0.0896:0.0864:0.150 mm. Each tergum from one to five is divided into a comparatively long anterior portion (which is limited behind by the dark transverse stripe mentioned above) and a narrow posterior area. The anterior portions represent the true terga; these are covered with rather densely placed hairs; the hairs of the posterior stripe are longer than the remainder (0.022:0.016 mm.), arising from very conspicuous white, subcircular dots about 0.013 mm. in diameter. Contrary to certain other species the posterior transparent areas which are weakly sclerotized and devoid of hairs are short, not longer than the dark stripe mentioned above. Aside from the posterior series there are six irregular rows of fine hairs visible on terga one and six, two to three in the middle of terga three and four, three on the sides of these terga and in the middle of plate five. Sternum of sixth segment not clearly defined; it appears to taper slightly behind, being more or less trapezium-like with the hind corners rounded; medially the plate is slightly broader than long (0.13:0.11 mm.). The area around the

sixth sternum is hairy. Spatula-shaped structure of segment seven with the handle 0.130 mm. long and a blade 0.048 mm. long by 0.042 mm. wide.

Holotype male: Ewa, Oahu, November, 1956, light trap (J. W. Beardsley); allotype female: Honolulu, Oahu (J. F. Illingworth).

Type and allotype in the Bernice P. Bishop Museum.

Family PIPUNCULIDAE Zetterstedt
The Big-headed or Big-eyed Flies

Pipunculini Zetterstedt, 1842, Dipt. Scand. 1:4.

Pipunculidae Walker, 1851, Ins. Brit. Dipt. 1:8,230.

Dorilaidae Speiser, 1910. In Sjöstedt, Wissensch. Ergebnisse der Schwedischen Zool. Exped. nach dem Kilimandjaro 2 (10):198.

The origin of the family name Pipunculidae is uncertain.

These are parasitic flies which are probably of considerable economic importance but whose biologies are still poorly understood. They are readily characterized from all other Diptera by the large globose compound eyes, which occupy almost the entire head (fig. 96). In this regard, on the mainland of United States, bombyliids of the genera *Metacosmus* Coquillett and *Paracosmus* Osten Sacken superficially resemble pipunculids and are often confused with them; the wing venation, antennae, and other characteristics of the two are, however, very different. The pipunculids fit intermediate between the families Syrphidae and the Platypezidae (this latter family is not present in Hawaii). They possess several characters in common with both of these but differ strikingly in biology and structural details. The characteristic wing venation (fig. 102c), the form of the head and antennae (figs. 102a and 105a), and the male and female genital characters (figs. 87d, 101b, 102d, and 104a) readily differentiate the pipunculids. For morphological details refer to Hardy (1943:9-15). My interpretation of the male genitalia and apical segments of the male abdomen differs somewhat from that of Aczél (1939 and 1940). The portion which I interpret as the sixth tergum was referred to as the sixth plus the seventh by Aczél, and my seventh tergum was referred to as the eighth. The apical portion of the abdomen which I refer to as the eighth abdominal segment was referred to as the epandrium or the ninth tergum by Aczél, and the portion which I refer to as ninth segment was called the basalplatte, or the tenth tergum, by Aczél.

The Hawaiian fauna now includes 36 known species plus 2 subspecies in the genus *Pipunculus* Meigen; 19 new species and 1 new subspecies are described in this study. It is obvious that there are still a number of new species to be described and much more work remains to be done on these flies. Some of the species are apparently very restricted in distribution, several are known only from very local areas. The Hawaiian species all show rather close relationship and have obviously arisen from one ancestral species which evidently came here by way of the southwest Pacific. Often the species may be very difficult to dif-

ferentiate because of this close relationship. Some of the characters which are useful in separating species from other areas are not of particular value in differentiating the Hawaiian species. Our species are characterized by having rather long, slender, lightly infuscated wings with the venation rather constant; the third costal section is usually shorter than the fourth, the r-m crossvein usually situated near the basal third of cell 1st M_2 and the last section of vein M_{1+2} gently curved. The third antennal segment is short- to long-acuminate but never obtuse ventrally. The face is not narrowed and the occiput is moderately expanded. The mesonotum has a row of fine hairs down each dorsocentral line and is otherwise bare except for scattered setae around the margins. Flexor spines and extensor hairs are moderately developed on the femora but do not appear to be useful as diagnostic characters. The presence or absence of strong, erect setae on the anterior surfaces of the hind tibia, the genital characters of both sexes, the coloration of the legs and antennae, the development of the marginal setae on the scutellum, and the degree of pollinosity of the abdomen and the thorax are apparently the most reliable characters for differentiating Hawaiian species.

Following Collin's concept (1956:163-164) in reviving *Cephalops* Fallén and giving it generic ("or subgeneric") rank based upon *Cephalops aeneus* Fallén, all of the Hawaiian species would fall in this group. Collin separates *Cephalops* from *Pipunculus*, s. str., by the hairs on the disc of the mesonotum being restricted to two dorsocentral lines, rather than having the setae scattered uniformly over the disc. The nature of the vestiture on the dorsum of the thorax appears to be of some specific value, but I consider the character rather trivial and treat *Cephalops* as a direct synonym of *Pipunculus*.

The genus *Tomosvaryella* Aczél does not occur in Hawaii although Aczél (1948:29) placed *Pipunculus rotundipennis* Grimshaw in the genus *Tomosvaryella*. This was not correct even though from the original description it would appear to belong here. I have studied the type in the British Museum (Natural History) and *rotundipennis* is a *Pipunculus* (*Pipunculus*).

ECONOMIC IMPORTANCE

The pipunculids are parasites mainly of Cicadellidae and Delphacidae, although I have recently seen specimens of an apparent new species which had been reared from nymphs of the membracid *Otinotus bantuantus* (Dist.) by A. L. Capener, Pretoria, South Africa; according to published reports they may possibly parasitize Cercopidae and some other families of Homoptera. Our knowledge of the biology and habits of these flies is very scanty. No host information is available for all of Africa (excepting the simple record cited above), South America, and much of Asia, and only a few host records have been published for the Nearctic, Palearctic, Pacific, and Oriental regions. Some of the reports of investigations of the habits of these flies would indicate that they may be of considerable economic importance. H. E. Dorst (see Hardy, 1943:16-17)

reported that in the spring of 1936 at the time of the migration of the beet leafhopper, *Circulifer tenellus* (Baker), in Utah, 60 percent of the individuals were parasitized by the pipunculids *Pipunculus subopacus* Loew and *Tomosvaryella vagabunda* (Knab). T. Esaki and S. Hashimoto (1936) reported that 65 percent of the specimens of the rice leafhopper *Nephotettix bipunctatus cincticeps* examined in 1935 were parasitized by pipunculids. R. C. L. Perkins (1905:123-126) reared 15 species of pipunculids from leafhopper hosts in Australia and indicated that in some cases the leafhoppers were heavily parasitized. During the period when sugar-cane leafhopper (*Perkinsiella saccharicida* Kirkaldy) was a serious pest of sugarcane in Hawaii, pipunculids were apparently common in the sugar-cane fields and apparently three or more species might have helped in effecting biological control of this leafhopper. Perkins (1905:153-154) reported that *Pipunculus juvator* Perkins and *P. terryi* Perkins were common in the sugar-cane fields on the islands of Hawaii and Kauai. F. X. Williams (1919) reported three species ("P. *juvator* Perkins, *P. hawaiiensis* Perkins, and as undescribed species") associated with sugar-cane leafhopper at Pahala, Hawaii, and Rosa (1919:12) and Timberlake (1919:38) reared *Pipunculus* from sugar-cane leafhoppers from Hawaii. I described *P. perkinsiellae* (Hardy, 1953:69) from specimens which had been reared from sugar-cane leafhopper on Oahu in 1918 and 1919. At the present time pipunculids are apparently completely absent in the sugar-cane fields; to my knowledge no specimens have been seen in the fields since those mentioned in the above reports. The sugar-cane leafhopper is, however, no longer a serious pest in Hawaii and even though it is still present the individuals are usually rather scarce.

There are but few host records of pipunculids in the New World literature. G. H. Kaloostian (1953) reported that a high percentage of the adults of the geminate leafhopper, *Colladonus geminatus* (Van Duzee), the principal vector of the western x-disease, virus of peach, cherry, and choke cherry in Utah, which were collected in the late summer of 1953, were parasitized by *Tomosvaryella lepidipes* Hardy. I have also seen specimens of *T. lepidipes* from Oregon which had been reared from *C. geminatus* by M. W. Nielson. C. F. Barrett from the Canada Department of Agriculture at Winnipeg has reported (in correspondence) that *Tomosvaryella sylvatica* (Meigen) is an important parasite of the leafhopper *Macrostelus fascifrons* (Stål) in Manitoba. Two species, as mentioned above, have been recorded as parasites of the beet leafhopper (see Hardy, 1943: 16-17). I have studied specimens of *Pipunculus (Eudorylas) subopacus* Loew reared from *Scaphytopius acutus* (Say) in Washington state, and I have accumulated considerable circumstantial host evidence concerning many of the Nearctic and Hawaiian species. Ashmead (1895) indicated that *Pipunculus subvirescens* Loew is probably parasitic on *Graphocephala versuta* (Say) (given as *Diedrocephala*).

Accurate host information is often very difficult to obtain since two or more closely related species are often collected in the same habitat, possibly even parasitizing the same species of leafhopper or at least associated with the same

plants. Very little definite host information is available to date for the Hawaiian species. At the present time apparently all the species parasitize native leafhoppers and no techniques have been devised for rearing the endemic leafhoppers in the laboratory. Much work needs to be done along this line so that we might increase our knowledge of the host specificity of the Hawaiian pipunculids.

The previous taxonomic work on the Hawaiian species was done by Grimshaw (1901), who described three species; Perkins (1905 and 1910), who described nine species; and Hardy (1953), who described seven species and one subspecies.

Genus *PIPUNCULUS* Meigen

Pipunculus Latreille, 1802, Hist. Nat. Crust. et Ins., 3:463.

Dorilas Meigen, 1800, Nouv. Class. Mouch., p. 31. Rejected name.

Microcera Meigen, 1803, Illiger's Mag. 2:273.

Cephalops Fallén, 1810, Specim. Ent. Nov. Dipt., p. 10.

Alloneura Rondani, 1856, Dipt. Ital. Prodr., 1:14.

Dorylas Kertész, 1910, Cat. Dipt., 7:368.

Collinias Aczél, 1940, Zool Anz. 132:151.

This genus is characterized by having a stigma present in the third costal section of the wing, the venation not reduced and the wing base not attenuated; by lacking ocellar bristles, and by having the occiput expanded and the head nearly hemispherical in lateral view.

The members of the typical subgenus are further characterized by possessing a fan of hairs on each propleuron.

Type of the genus: *Pipunculus campestris* Latreille.

Only the typical subgenus occurs in Hawaii.

KEY TO THE SPECIES OF *PIPUNCULUS* KNOWN FROM HAWAII

1. Posterior tibia each with one or more strong erect
anterior bristles on the swollen portion (fig. 102b).....2
Lacking strong bristles on the posterior tibiae31
- 2(1). Legs entirely yellow except for the coxae, or with
not more than a slight discoloration of brown on
the dorsal surfaces of the femora in *obscuratus*
Hardy3
At least the femora conspicuously banded dark brown
to black7
- 3(2). The anterior bristles on the hind tibiae of the female
very strong, over one-third as long as the tibia.

- Front tibiae with strong erect posterior bristles medianly, and middle tibiae with strong median bristles on both the anterior and posterior surfaces. Crossvein r-m situated near the middle of cell 1st M_2 . Front entirely pollinose (male unknown). (Hawaii).....**macrothrix** n. sp.
- Bristles of hind tibiae scarcely one-sixth as long as the segment. Front and middle tibiae lacking median bristles. Crossvein r-m situated at basal third of cell 1st M_2 . Front of female polished black on upper portion.....4
- 4(3). At least the apical portion of the fifth tergum of the male polished black. Ninth segment of male not extending beyond bases of claspers (fig. 110c). Claspers longer than wide and rather quadrate at apices. Female ovipositor with a pair of strong basal lobes beneath (fig. 107d) or with not more than the upper one-fourth of the female front polished black (some aberrant specimens of *obscuratus* (Hardy) may fit here).....5
- Abdomen of both sexes entirely pollinose, not polished. Ninth segment of male extending almost to apices of claspers. Claspers about as wide as long with a small pointed lobe on inner apices (fig. 98c). Female ovipositor lacking basal lobes (fig. 98d). Upper half of female front polished black. (Hawaii).....**hawaiiensis** Perkins.
- 5(4). Claspers of male attenuated at apices and strongly curved upward beneath the abdomen (fig. 110c and 110d). Female ovipositor lacking conspicuous basal lobes. Upper one-fourth of female front polished black. (Oahu).....**proditus** n. sp.
- Not fitting the above.....6
- 6(5). Femora with brown dorsal discolorations. Claspers of male nearly three times longer than wide and not expanded apically. The concavity on the posterior margin of the ninth segment is very shallow and the cerci extend well beyond the apices of the ninth (fig. 107c). The third costal section is one-third to one-fourth as long as the fourth section. The oviduct of the female ovipositor is situated on a prominence and the front of the female is entirely gray

pollinose except for the extreme upper portion.

The abdomen of the male is almost entirely opaque.

(Hawaii) **obscuratus** (Hardy).

Femora all yellow. Claspers of male scarcely one-half

longer than wide and expanded apically. The con-

cavity on the posterior margin of the ninth seg-

ment is well developed and the cerci scarcely ex-

tend beyond the apices of the ninth (fig. 91c). The

third costal section is one-half to three-fourths as

long as the fourth. The upper half of the female

front is polished black. The oviduct is not situated

on a prominence (fig. 91d). The abdomen of the

male is predominantly polished black. (Oahu)

..... **cornutus** (Hardy).

7(2). Fifth tergum conspicuously bristled at the apex.....8

Fifth tergum lacking conspicuous bristles.....9

8(7). Abdomen almost entirely polished black. Third an-

tennal segment pale yellow. Upper one-fourth to

one-fifth of female front polished black. (Hawaii)

..... **acrothrix** Perkins.

Abdomen entirely pollinose except for the narrow

apex of the fifth tergum and sometimes the apex of

the fourth. Antennae entirely brown, third segment

faintly tinged with yellow. Upper two-thirds of fe-

male front polished black. Fourth and fifth sterna

of male produced into anteriorly directed knobs

in the median portions (fig. 90c). (Kauai).....

..... **chauliosternum** n. sp.

9(7). Males10

Females23

10(9). Thorax and abdomen entirely pollinose, at least light-

ly so, no polished areas present. Third antennal

segment black and very long acuminate; the at-

tenuated portion is longer than the remainder of

the segment (fig. 97a). Male genitalia as in figure

97c. (Maui, Molokai)..... **haleakalae** (Hardy).

At least the apical portion of the fifth tergum pol-

ished black, bare of pollen. Third antennal seg-

ment not as above; if long acuminate, it is yellow.....11

11(10). Hypopygium of male with a large membranous area

covering the entire apex (fig. 88b). Claspers short

- and broad, each with two points at inner apex (fig. 88c). (Kauai) **bicuspidis** n. sp.
- Membranous area confined to the right of the apex, or very small and inconspicuous, or lacking (figs. 106b and 87a). Claspers not as above..... 12
- 12(11). Male hypopygium rounded and with no membranous area (fig. 106b), sometimes with a longitudinal seam on the right side (fig. 92c)..... 13
- Male hypopygium with a conspicuous membranous area 15
- 13(12). Hypopygium small, about one-third as long as the fifth abdominal segment and with no seam on the right side (fig. 106b). Ninth segment not enlarged, or conspicuous from a lateral view, and claspers shaped as in figure 106c. Femora broadly yellow at bases and apices. Third antennal segment yellow, tinged lightly with brown. (Oahu) .. **oahuensis** Perkins.
- Hypopygium large, equal or slightly larger than the fifth abdominal segment (fig. 92c), and with a longitudinal seam on the right side. Ninth segment enlarged; as seen from left side it extends two-thirds or more the distance to the apex of the eighth segment (fig. 92b). Claspers not as above. Femora narrowly yellow at bases and apices. Third antennal segment black or yellow..... 14
- 14(13). Fourth and fifth sterna each produced into an anteriorly projecting point; this is readily seen *in situ* (fig. 92b). Sixth tergum posterior to the fifth (fig. 92c). Eighth segment entirely opaque. Claspers as in figure 92d. Third antennal segment yellow. (Maui and Molokai)..... **delomeris** n. sp.
- Sterna not as above. Sixth tergum ventral to the fifth. Left side of eighth segment polished black. Genitalia as in figure 101d. Antennae entirely black. (Maui)..... **laterisutilis** n. sp.
- 15(12). Ninth segment very large and conspicuous; as seen from the right side it is as large or larger than the eighth and as seen from the left side it is almost equal to or distinctly larger than the eighth segment (fig. 87d) 16
- Ninth segment normal in development, small com-

- pared to the eighth, and rather inconspicuous from lateral views17
- 16(15). Ninth segment larger than the eighth as seen from right side and longer than eighth as seen from left (fig. 87d). The claspers are slightly tapered at apices and each has a small subapical point on inner side (fig. 87b). Third antennal segment clear yellow. Tibiae predominantly yellow. (Hawaii).....**apletomeris** n. sp.
Ninth segment almost equal in size to eighth as seen in right side view and distinctly shorter than the eighth segment as seen from the left. Claspers truncate at apices (fig. 103d). Third antennal segment brown, tinged lightly with yellow. Tibiae predominantly black. (Molokai and Maui)....**megameris** n. sp.
- 17(15). Claspers 2.5–3 times longer than wide, at least slightly curved as seen from lateral view, blunt at apices, and densely hairy below. Ninth segment usually distinctly wider than long18
Claspers not much longer than wide, pointed at apices, not curved or conspicuously hairy (fig. 118c). Hypopygium with a large subapical membranous area (fig. 118b). (Maui, Molokai, Lanai, and probably Hawaii)**uluhe** (Hardy).
- 18(17). Fourth and fifth sterna developed into blunt anteriorly projecting lobes, readily seen *in situ*. Claspers as in figure 90c. Apex of abdomen bristly. (Kauai)**chaulios sternum** n. sp.
Sterna normal19
- 19(18). Claspers strongly curved upward, outer clasper developed into a slender point at apex (fig. 110c). (Oahu)**proditus** n. sp.
Claspers only gently curved, rounded at apices.....20
- 20(19). Hypopygium about equal in length to the fifth abdominal segment. Membranous area broadly bisecting eighth segment on the venter. Claspers as in figures 99d and 117d.....21
Hypopygium poorly developed, about one-half as long as the fifth segment. Membranous area not bisecting eighth segment. Terga four and five polished. Claspers as in figure 89d. (Hawaii).....**canutifrons** n. sp.

- 21(20). Ninth segment wider than long, claspers as in figures 117d and 108b. Third antennal segment yellow.....22
 Ninth segment longer than wide. Claspers as in figure 99d. Third antennal segment brown. (Hawaii)
**injectivus** n. sp.
- 22(21). Only the apical one-half to two-thirds of fifth tergum polished black. Claspers blunt at apices, slightly pointed on inner margins (fig. 117d). (Maui).....
**trichostylis** n. sp.
 Fourth and fifth terga predominantly black. Each clasper attenuated to a point at apex (fig. 108b). (Maui)**obstipus** n. sp.
- 23(9). Abdomen entirely opaque, densely pollinose. (The females of this complex may sometimes be difficult to differentiate)24
 At least the fifth tergum polished black, bare of pollen.....29
- 24(23). Third antennal segment yellow.....25
 Third antennal segment brown, fringed with yellow. Upper one-half to three-fifths of front polished black. (Hawaii)**injectivus** n. sp.
- 25(24). Sixth abdominal segment well developed; as seen in dorsal view it is about one-half as long as the fifth segment. The posterior margin of the sixth is gently concave. The piercer is conspicuous.....28
 Sixth segment poorly developed, scarcely, if at all, visible from a dorsal view, and deeply concave on the hind margin (fig. 118e). Piercer usually hidden beneath the abdomen.....26
- 26(25). Upper portion of front polished black27
 Front entirely gray pollinose. (Hawaii).....**apletomeris** n. sp.
- 27(26). Femora broadly yellow at bases and apices. Tibiae yellow (some female specimens may have large conspicuous processes at the base of the ovipositor as in figure 118f). (Maui, Molokai, Lanai, and probably Hawaii)**uluhe** (Hardy).
 Femora almost all black. Tibiae discolored with brown to black (Molokai, Maui).....**delomeris** n. sp.
- 28(25). Third antennal segment pale yellow. Femora broadly banded with brown medianly. Piercer extending to about the base of the fourth abdominal segment (fig. 110e). (Oahu)**proditus** n. sp.

Third antennal segment dark brown to black. Femora black except for narrow bases and apices. Piercer extending to or beyond apex of second abdominal segment (fig. 97d). (Maui and Molokai) **haleakalae** (Hardy).

- 29(23). Mesonotum, scutellum, and abdomen predominantly polished black. Crossvein r-m situated just beyond the middle of cell 1st M_2 . (Molokai and Maui) **holomelas** Perkins.

Mesonotum and scutellum at least lightly pollinose. Abdomen polished black only on the fifth tergum. Crossvein r-m situated at basal third of cell 1st M_230

- 30(29). Legs almost entirely black. Third antennal segment moderately long acuminate (fig. 103a). Ovipositor base large and conspicuous (fig. 103e). (Maui and Molokai) **megameris** n. sp.

Tibiae yellow, bases and apices of femora broadly yellow. Ovipositor and the sixth abdominal segment usually completely hidden by the fifth tergum. (Oahu and possibly Hawaii) **oahuensis** Perkins.

- 31(1). Legs, excluding coxae, entirely yellow, or with but slight discoloration, on the dorsal surfaces of the femora32

Femora conspicuously marked with brown or black.....37

- 32(31). Abdomen of male entirely polished black except for the gray first tergum. Scutellum with short, inconspicuous marginal setae. Femora slightly discolored with brown on the dorsal surfaces. Hypopygium with an apical membranous area. Female with pad-like developments on the underside of each mid and front tibia (fig. 94b). (Oahu) .. **filicicolus** n. sp.

Abdomen predominantly or entirely opaque. Scutellum with six to eight long marginal setae. Femora usually all yellow. Hypopygium with a subapical or lateral membranous area, except in *perkinsiellae* and *terryi*. Pad-like developments lacking on the female tibiae33

- 33(32). Third costal section about one-half as long as the fourth. Male hypopygium with a large apical membranous area. Female ovipositor large and conspicuous34

Third costal section about equal to the fourth. Hypo-

- pygium with a subapical or lateral membranous area35
- 34(33). Sixth segment large, about equal in size to the seventh and curved upward on the venter. Membranous area not completely bisecting eighth segment. Claspers blunt (fig. 109c). Female ovipositor as in figure 109d. (Oahu)..... *perkinsiellae* (Hardy).
Sixth segment normal. Membranous area completely bisecting eighth segment. Claspers rather long pointed (fig. 114c). Female ovipositor as in figure 114d. (Some specimens may run here.) (Kauai) *terryi* Perkins.
- 35(33). Male hypopygium with a large membranous area occupying the right side of the apex (fig. 113b). Abdomen entirely pollinose, lightly dusted over the fifth tergum of the male. The membranous area not bisecting the eighth segment as seen from the ventral view. Claspers broad, truncate at apices as seen in side view (fig. 113d). Ovipositor short, extending scarcely beyond base of fifth segment (fig. 113e). (Oahu) *swezeyi* Perkins.
Male hypopygium with a small subapical membranous area (fig. 85c). Apical portion of fifth tergum polished, bare of pollen. Membranous area usually completely bisecting eighth segment on venter. Claspers with two points at the apices as in figure 85d. Female ovipositor extending almost to base of abdomen (fig. 85b).....36
- 36(35). As seen in ventral view the membranous area completely bisects the eighth segment (fig. 85d). Third antennal segment brown. (Maui and Molokai).....
..... *alienus* (Hardy).
Membranous area not completely bisecting eighth segment (fig. 85e). Third antennal segment yellow (Oahu) *alienus koolauensis* n. subsp.
- 37(31). Legs entirely brown to black or but narrowly yellowed on the knees. Third antennal segment dark brown to black, short acuminate.....38
At least the tibiae chiefly yellow. Third antennal segment often yellow, long acuminate.....40
- 38(37). Male hypopygium with a large apical membranous area which completely bisects the eighth segment

on the venter (fig. 100c). Female ovipositor prominent (fig. 100d). Sixth segment of female well developed, nearly as long as the fifth, posterior margin almost straight. (Maui) -----**juvator melanopodis** (Hardy).

Male with a small subapical membranous area or with no membranous area. Eighth segment not bisected by the membrane. Female ovipositor small, inconspicuous. Sixth segment of female poorly developed and deeply cleft on the hind margin, often not visible from dorsal view.....39

- 39(38). Male hypopygium with a subapical membranous area on the right side (fig. 111b) and with no tibial spurs. (Hawaii, also probably on Molokai, Lanai, Oahu, and possibly Kauai)-----**rotundipennis** Grimshaw.

Male genitalia with no visible membranous area but with a small longitudinal seam on the right side. Hind tibiae of male each ending in a spur, or point on underside (fig. 105e); this is best seen in profile with reflected light. (Hawaii and Maui)-----
-----**nigrotarsatus** Grimshaw.

- 40(37). Male hypopygium with a conspicuous membranous area (this may be lateral and sometimes looks like a large depression on the right side). All tibiae and at least the basal segments of the tarsi yellow. Hind tibiae of male lacking apical spurs.....41

Male genitalia with no membranous area but with a longitudinal seam on the right side (fig. 105c, 105d). Each hind tibia of male ending in an apical spur (fig. 105e). Tibiae discolored with brown to black in the median portions. Tarsi chiefly dark colored. (Some specimens may run here.) (Hawaii and Maui) -----**nigrotarsatus** Grimshaw.

- 41(40). Very tiny species, body about 2.5 mm.; wings, 3.2–3.4 mm. Membrane of male hypopygium apical, not bisecting eighth segment on the venter (fig. 95c). (Hawaii)-----**gnomus** n. sp.

Larger species, body usually over 4 mm. and wings over 5 mm. Membrane completely bisecting eighth segment on the venter.....42

- 42(41). Femora predominantly yellow, banded with brown medianly, rather faintly so in the female. Each clasper of male tapered into a sharp point on outer

- apex (fig. 114c). Abdomen entirely pollinose in both sexes. (Kauai) **terryi** Perkins.
 Femora chiefly black. Claspers not as above. At least fifth tergum of male polished except in some specimens of **juvencus** n. sp., which have square claspers (fig. 101b). 43
- 43(42). Males 44
 Females 53
- 44(43). Hypopygium with a large apical membranous area (fig. 86b) 45
 Membranous area situated on right side of eighth segment (figs. 93b, 112b, and 118b). 50
- 45(44). Scutellum with short, inconspicuous marginal setae; the longest hairs are about one-sixth as long as the scutellum. Large, predominantly polished black species. Abdomen entirely polished except for the first tergum. Body usually over 6 mm. and wings 7-9 mm. 46
 Three to four pairs of large bristle-like hairs on the hind margin of the scutellum; these are about one-half as long as the scutellum. At least abdominal terga one to three pollinose. Usually distinctly smaller species: body, 4.0-5.5 mm.; wings 4.5-6.7 mm. 48
- 46(45). Sides of mesonotum polished, an area down each side bare of pollen. As seen from ventral view the claspers are about two times longer than wide and are truncate at apices (fig. 86c). (Oahu)..... **amplus** n. sp.
 Mesonotum entirely opaque. Claspers not as above..... 47
- 47(46). Male claspers short and broad, each with a small lobe developed on inner apex (fig. 104b). Smaller species: body, 5.6 mm.; wings, 6.5-7.5 mm. (Molokai and Maui) **molokaiensis** Grimshaw.
 Claspers rather slender, tapered, pointed at apices as seen in ventral view fig. 116d), blunt and rounded as seen from side (fig. 116c). Large species: body, 6.3-6.7 mm.; wings, 7.9-9.2 mm. (Maui) **titanus** n. sp.
- 48(45). Claspers quadrate in shape, ninth segment slightly wider than long (fig. 101b). (Maui) **juvencus** n. sp.
 Claspers about two times longer than wide, each with

- a small subapical lobe on inner margin. Ninth segment longer than wide (fig. 100c).....49
- 49(48). Tibiae and basal segments of tarsi yellow. (Hawaii, Oahu, Maui, Lanai, and Kauai).....**juvator** Perkins.
Tibiae and tarsi predominantly black. (Maui, Molo-kai, and Lanai)**juvator melanopodis** (Hardy).
- 50(44). Ninth segment large, plainly visible from a dorsal view (fig. 112b). As seen from a ventral view the ninth segment extends three-fourths the distance to the apex of the eighth segment. Each clasper slender and attenuated into a point on outer apex (fig. 112c). As seen from left lateral view the ninth segment extends nearly to apex of eighth segment. (Maui and Lanai).....**sectus** n. sp.
Ninth segment normal in size, not visible from above and scarcely extending past anterior margin of the eighth segment. Claspers not so slender, truncate at apices (fig. 93c).51
- 51(50). Third antennal segment bright yellow. Claspers slightly pointed on outer apices (fig. 118c). (Some aberrant specimens may run here.). (Maui, Molo-kai, Lanai, and probably Hawaii).....**uluhe** (Hardy).
Third antennal segment brown to black. Claspers not as above.....52
- 52(51). Hypopygium with a very large membranous area occupying all of the right side (fig. 93b-c). Third antennal segment long acuminate (fig. 93a). Scutellar bristles large, one-half as long as the scutellum. Apex of abdomen conspicuously bristled. (Kauai)**euryhymenos** n. sp.
Membranous area subapical, comparatively small (fig. 115b-c). Third antennal segment acute to short acuminate. Marginal setae of scutellum rather short, one-fourth to one-third as long as the scutellum. Apex of abdomen sparsely setose. (Hawaii)**timberlakei** (Hardy).
- 53(43). Sixth abdominal segment poorly developed, scarcely visible except in direct end view (fig. 115d). Ovipositor small, usually hidden by the fifth abdominal segment, and extending only to about the base of the fourth segment.....54

Sixth segment well developed, at least two-fifths as long as the fifth abdominal segment, and plainly visible from dorsal view. Ovipositor conspicuous, not hidden by the fifth segment, and extending approximately to the apex of the second (fig. 112d).

-55
- 54(53). Third antennal segment long acuminate (fig. 93a).
(Kauai) **euryhymenos** n. sp.
Third antennal segment acute to short acuminate
(fig. 115a). (Hawaii) **timberlakei** (Hardy).
- 55(53). Piercer longer than base. Sixth segment three-fourths
as long as the fifth. Bases and apices of femora
broadly yellow.56
Piercer much shorter than base. Sixth segment about
one-half as long as the fifth. Femora entirely black
except for very narrow apices. (Maui and Lanai)
..... **sectus** n. sp.
- 56(55). Ovipositor without basal tubercles (fig. 100d). (Ha-
waii, Maui, and Oahu) **juvator** Perkins.
Ovipositor with a pair of small tubercles below (fig.
104a). (Molokai and Maui) **molokaiensis** Grimshaw.

Pipunculus (Pipunculus) acrothrix Perkins (fig. 84a-c).

Pipunculus acrothrix Perkins, 1913, Fauna Hawaiiensis 2:698.

Endemic. Hawaii (type locality: Kilauea). Known only from the type.
Type in the Bernice P. Bishop Museum.

This species is known only from the female and is characterized by having a clump of long black bristles at the apex of the fifth abdominal tergum (fig. 84b). It fits closest to *P. chauliosternum* n. sp. from Kauai but differs by having the abdomen predominantly polished black, the third antennal segment yellow, and the front polished black only on the upper one-fourth to one-fifth.

Following is a redescription of the type female.

FEMALE. The occiput is normal, not swollen, and is less than one-third as wide as the eyes. The third antennal segment and the base of the arista are clear yellow. The third segment is moderately long acuminate (fig. 84a). The bristles of the second antennal segment are black, those on the underside extend about half the length of the third segment. The front is moderately expanded at about the middle and is almost entirely cinereous; only the upper one-fourth to one-fifth is polished black. The face is slightly narrower than the front and is densely gray pubescent. The mesonotum is chiefly brownish gray above and gray on the sides; rather faintly shining. The humeri are dark brown

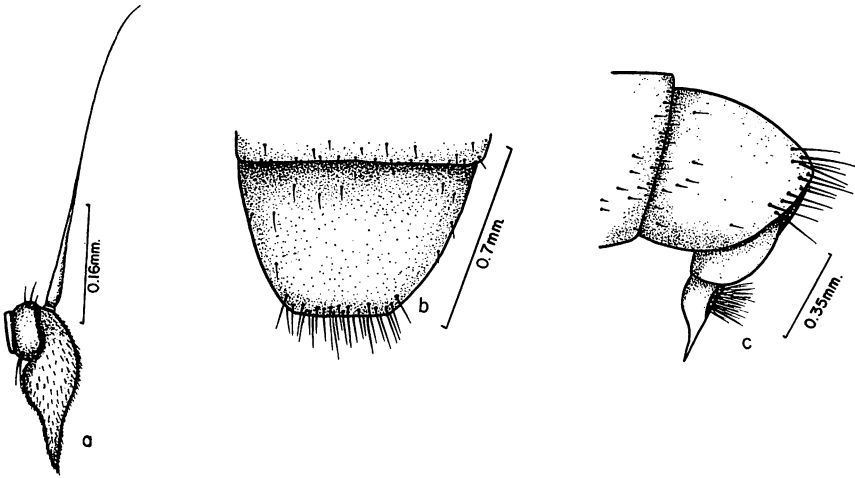


Figure 84—*Pipunculus acrothrix* Perkins: a, antenna; b, apex of female abdomen, dorsal; c, female ovipositor.

to black; rather thickly covered with short pile. The scutellum is densely gray-brown pollinose. The dorsocentral hairs are short. The scutellum has a row of ten to twelve strong bristles around the hind margin. The halteres are yellow. The coxae are black. The hind trochanters are yellow, the middle and front pair are brownish yellow. The femora have broad yellow bases and apices and wide black median bands. The tibiae are all yellow and the tarsi are yellow except for the brownish apical segments. Flexor spines are well developed on all femora. The hind tibiae each possess a row of three or four strong erect, yellow bristles on the outside of the swollen portion; the length of these bristles is greater than the width of the tibia. The wings are hyaline or nearly so. The stigma fills all of the third costal section. The third section is about one-half as long as the fourth and the two sections combined are about equal in length to the fifth. The r-m crossvein is situated at about the basal third of cell 1st M_2 and the last section of vein M_{1+2} is slightly curved. The abdomen is chiefly polished black. The first tergum is gray, the basal half of the second tergum and the lateral margins of the others are lightly gray pollinose. The abdomen is widest at about segment four and is rather sparsely pilose with scattered short hairs on the lateral and apical margins of the segments. The fifth segment has a conspicuous clump of long black bristles at its apex (fig. 84b). The sixth segment is short and inconspicuous and is not visible from a dorsal view. The ovipositor is small and largely yellow; the piercer is about equal in length to the base and extends to about the apex of segment four (fig. 84c).

Length: body, 4.75 mm.; wings, 5.50 mm.

MALE. Unknown.

Pipunculus (Pipunculus) alienus (Hardy) (fig. 85a-d).

Dorilas (Dorilas) alienus Hardy, 1953, Proc. Haw. Ent. Soc. 15 (1):59, fig. 1a-d.

Endemic. Maui (type locality: Iao Valley), Molokai, and Lanai. The latter is a new island record. Specimens are on hand from Lanaihale, Lanai, 3,200 ft., June, 1953 (D.E. Hardy).

The type is in the United States National Museum collection.

Hosts. The leafhopper hosts are unknown; specimens have been taken on several occasions flying over *Cibotium* and *Nephrolepis* ferns.

This species fits near *P. swezeyi* Perkins but is differentiated by having the membranous area on the eighth abdominal segment confined to the apex as seen from a dorsal view and completely bisecting the eighth segment as seen from a ventral view. Also, by the very differently shaped claspers of the male (fig. 85d) and the much larger, more elongate ovipositor of the female (fig. 85b).

The third antennal segment is brown, tinged faintly with yellow, and moderately acuminate (fig. 85a). The scutellum has six to eight strong black setae on the hind margin. The legs are almost entirely yellow, the coxae are brown to black and a tinge of brown extends over the apical segments of the tarsi. The third costal section of the wing is about equal in width to the fourth and the third and fourth combined are about one-third longer than the fifth section. The r-m crossvein is situated at the basal third of cell 1st M_2 and the last section of vein M_{1+2} is gently curved. The abdomen is predominantly opaque brown, gray over the first tergum, and polished black on the apical portion of the fifth tergum. From a dorsal view the hypopygium is approximately two-thirds as long as the fifth abdominal segment and has a small subapical membranous area (fig. 85c). From a ventral view, the membranous area completely bisects the eighth segment. The ninth segment is about as wide as long; the concavity on the posterior margin extends almost half the length of the segment. The claspers terminate in two sharp points as in figure 85d. In the female, the upper third to two-fifths of the front is polished black. The abdomen is entirely subopaque black covered with brownish gray pollen. The sixth segment is about equal in length to the fifth and is not excised on the posterior margin. The ovipositor is straight and extends almost to the base of the abdomen (fig. 85b).

Length of male: body, 4.0-4.5 mm.; wings, 5.0-5.8 mm. Length of female: body, 3.3-3.6 mm.; wings, 4.5-5.0 mm.

Pipunculus alienus koolauensis, new subspecies (fig. 85e).

Specimens from the Koolau Mountains on Oahu fit the description of typical *alienus* in all respects except that the third antennal segment is yellow and the membranous area of the male hypopygium does not completely bisect the eighth

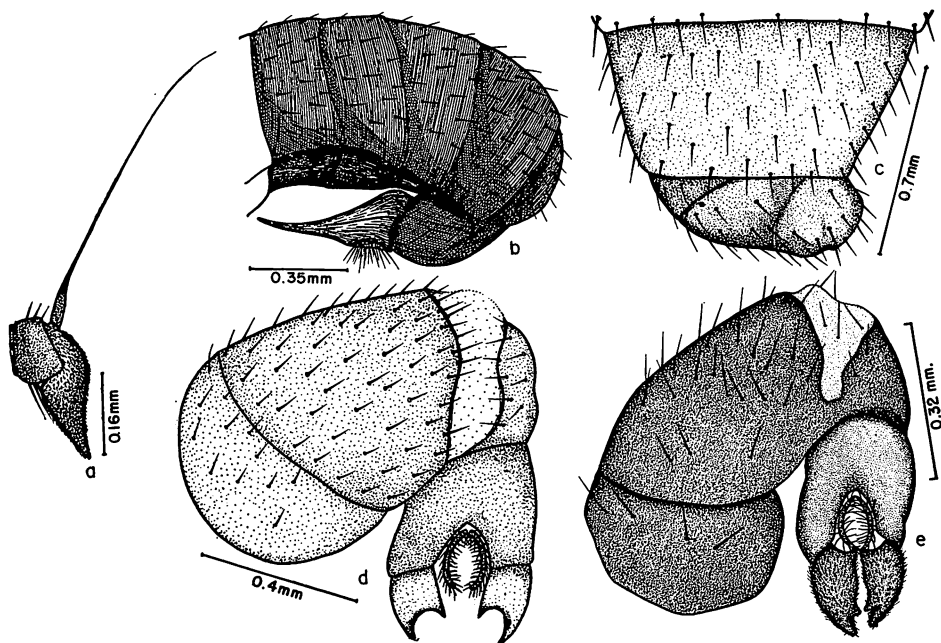


Figure 85—*Pipunculus alienus* (Hardy): a, antenna; b, female abdomen, lateral; c, apex of male abdomen, dorsal; d, male genitalia, ventral. *P. alienus koolauensis* n. subsp.: e, male genitalia, ventral.

segment as seen from a ventral view (fig. 85e). The male claspers also seem to differ slightly as shown in the above figure, but I am unable to find differences which I would consider to be of more than subspecific importance.

I am unable to separate the females of these two subspecies except, possibly, by the yellow third antennal segment of *koolauensis*.

Length of male: body, 4.6 mm.; wings, 5.6 mm. Length of female: body, 3.8–4.0 mm.; wings, 4.8–5.0 mm.

Holotype male: Mt. Tantalus, Oahu, November, 1953 (M. S. Adachi). Allotype female: Pupukea Trail, Oahu, 1,500 ft., December, 1952 (D. E. Hardy). Fifteen paratypes (12 males and 3 females) from the following localities in the Koolau Mountains, Oahu: same as type, flying over sword ferns (*Nephrolepis* sp.), April to August, 1952–1957 (D. E. Hardy and M. S. Adachi); Halemanu, Oahu, May, 1953 (D. E. Hardy); Konahuanui Trail, August, 1953 (M. S. Adachi); and Poamoho Trail, 1,700 ft., May, 1953 (D. E. Hardy).

Type, allotype, and some of the paratypes in the Bernice P. Bishop Museum. The remainder of the paratypes are being deposited in the following collections: United States National Museum, British Museum (Natural History), and the University of Hawaii.

Pipunculus (Pipunculus) amplus, new species (fig. 86a-c).

This species is superficially like *P. juvator* Perkins but is predominantly polished black and has short, inconspicuous, marginal setae on the scutellum. It shows relationship to *P. molokaiensis* Grimshaw and *titanus* n. sp. but is differentiated by having the sides of the mesonotum polished and by the differences in the development of the male claspers (fig. 86c).

MALE. *Head:* The junction of the compound eyes is almost two times longer than the lower portion of the front. The lower front and the face are densely gray pubescent. The occiput is chiefly cinereous, lightly brownish on the upper portion. The first two antennal segments are dark brown to black, the third segment and the mouthparts, including the palpi, are clear yellow. The third segment is moderately acuminate below (fig. 86a). *Thorax:* The scutellum and the median portion of the mesonotum are rather densely brown pollinose; the sides of the mesonotum are polished black, devoid of pollen. The pleura and the metanotum are entirely gray pollinose. The humeri are black. The halteres are chiefly yellow with a slight brownish tinge on the knobs. The setae of the dorsocentral row and at the hind margin of the scutellum are very short and inconspicuous; the latter are scarcely one-sixth as long as the scutellum. The propleural fan is made up of four to five long yellow hairs. *Legs:* The coxae are entirely dark brown to black. The trochanters, the tibiae, and the basal segments of the tarsi are yellow; the femora are predominantly dark brown to black with broadly yellow apices and bases. The femora are moderately thickened and flexor spines are well developed on all pairs. The hind tibiae have no strong bristles on the outside surface. *Wings:* Distinctly brownish fumose. The stigma is dark brown and fills all of the third costal section. The third section is approximately equal in length to the fourth; the two sections combined are slightly longer than the fifth section. The r-m crossvein is situated near the basal one-third of cell 1st M_2 . The last section of vein M_{1+2} is moderately curved. The last section of vein M_{3+4} is about equal in length to the m crossvein. The petiole of the cubital cell (vein $Cu_1 + 1st A$) is about two-thirds as long as the last section of M_{3+4} . *Abdomen:* The first tergum is brown on the basal portion and gray on the apical half. The second tergum is predominantly polished black; the narrow basal portion is opaque brown; the remainder of the abdomen is entirely polished black. The first tergum has a row of eight to ten rather strong black bristles on each side; the abdomen is otherwise very sparsely pilose. The abdomen is broadest at the junction of segments two and three. The eighth abdominal segment is opaque brown; is almost equal in length to the fifth segment, and has a large membranous area at its apex (fig. 86b). The membranous area completely bisects the eighth segment on the venter. The ninth segment is dark brown to black and slightly longer than wide. The claspers are yellow-brown, straight-sided, about two times longer than wide, and truncate at apices (fig. 86c).

Length: body, 5.5-6.5 mm.; wings, 6.8-8.0 mm.

FEMALE. Unknown.

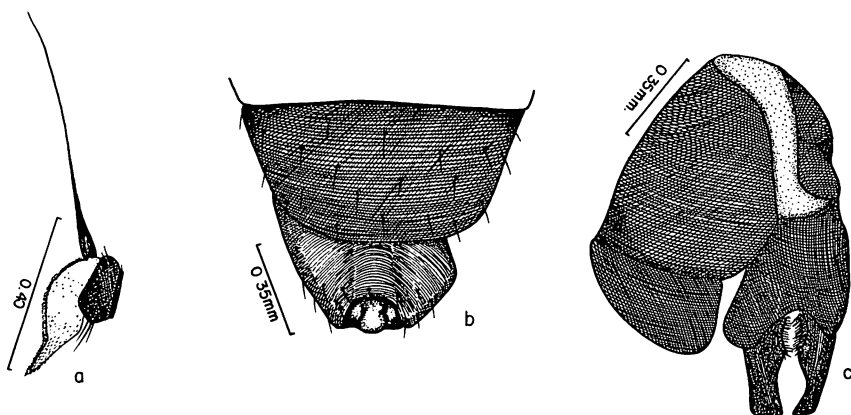


Figure 86—*Pipunculus amplus* n. sp.: a, antenna; b, apex of male abdomen, dorsal; c, male genitalia, ventral.

Holotype male: Mt. Tantalus, Oahu, flying over assorted ferns (mostly *Nephrolepis* sp.), April, 1954 (D. E. Hardy). Sixteen male paratypes: all but one taken same locality as type, April through December, 1951–1954 (D. E. Hardy, M. S. Adachi, and C. K. Yasuda); one specimen was taken on Hauula Ridge Top, 1,700 ft. elevation, flying over staghorn fern (*Dicranopteris linearis* (Burm.)) Underw., November 22, 1952 (C. Hoyt).

The type and some of the paratypes are being deposited in the Bernice P. Bishop Museum. The remainder of the paratypes are in the following collections: United States National Museum, British Museum (Natural History), and the University of Hawaii.

This species apparently is very restricted in distribution on Mt. Tantalus. I have found it only in one limited area. All but one of the above specimens were taken flying over the ferns under a small *Acacia koa* tree within a radius of about twenty feet. I have searched for them many times in other areas on the mountain but have not found them.

***Pipunculus* (*Pipunculus*) *apletomeris*, new species (fig. 87a–d).**

This species is closely related to *P. megameris* n. sp. and fits near this in the key. It is differentiated by the very greatly developed ninth segment of the male (fig. 87c, d), by the clear yellow third antennal segment, by the predominantly yellow tibiae, and by the differences in the male claspers (figs. 87b and 103d). The female specimens which appear to be associated with the males at hand are very close to those of *P. canutifrons* n. sp. and I am unable to separate these.

MALE. *Head:* The occiput is broad, about one-fourth as wide as the eye; the upper two-fifths is subshining, dusted with brown pollen. The lower portion is opaque gray. The junction of the compound eyes is nearly two times longer

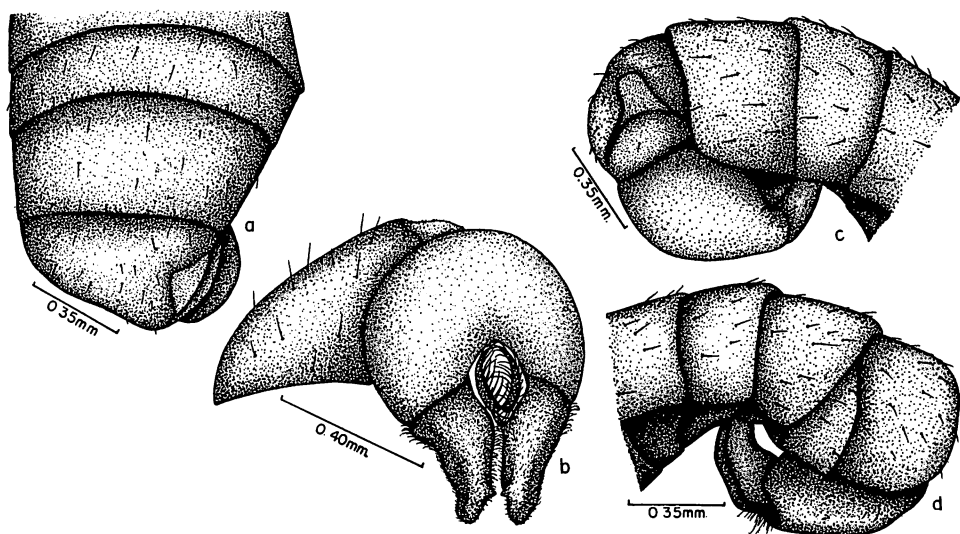


Figure 87—*Pipunculus apletomeris* n. sp.: a, apex of male abdomen, dorsal; b, male genitalia, ventral; c, male abdomen, right side; d, male abdomen, left side.

than the lower portion of the front. The first two antennal segments are brown, the third is pale yellow, long acuminate below (similar to that of *megameris*). *Thorax*: Subshining black, lightly dusted with brown on the dorsum, gray on the sides. The dorsocentral hairs are short and inconspicuous. The scutellum has about eight moderately long bristles on the hind margin, the longest about two-fifths the length of the scutellum. The humeri are brown to black, tinged with yellow on the hind margins. The halteres are yellow, tinged with brown at their apices. *Legs*: The femora are black except for narrow yellow apices and bases. The tibiae are yellow, tinged with brown on the ventral portions. The tarsi are brown dorsally; the ventral brush is yellow. The hind tarsi are slightly arcuate as seen in lateral view; each has two moderately strong, erect, black setae on the swollen portion. The femora are moderately thickened; the flexor spines are well developed. *Wings*: Evenly infuscated, the stigma is brown and fills all of the third costal section. The third costal section is slightly shorter than the fourth and the two combined are about equal in length to the fifth section. The r-m crossvein is situated at the basal third of cell 1st M_2 and the last section of vein M_{1+2} is gently curved. The last section of vein M_{3+4} is about equal in length to the m crossvein. Vein $Cu_1 + 1st A$ is about four-fifths as long as the m-cu crossvein. *Abdomen*: The first tergum is gray and has a row of about five black bristles on each side. Terga two and three are subshining black, lightly dusted with brown pollen. The fourth tergum is polished black with a thin dusting of gray along the hind margin. The fifth tergum is polished black over the dorsal portion, gray-brown pollinose on the sides. The eighth segment is predominantly brown pollinose, often with a small polished black area on the

left side. From a dorsal view, the eighth segment is almost as long as the fifth, is evenly rounded, and has a conspicuous membranous area on the right side (fig. 87a). The ninth segment is plainly visible from a dorsal view. The ninth segment is greatly developed; as seen from the left side (fig. 87d) it is longer than the eighth segment, as seen from the right it is larger than the eighth segment (fig. 87c). From a ventral view, the ninth segment is longer than wide and has a gentle concavity on the posterior margin. The claspers are rather slender, slightly attenuated at apices, and each has a small subapical point on the inner side (fig. 87b).

Length: body, 4.5–4.7 mm.; wings, 6.6–6.9 mm.

FEMALE. The specimens at hand fit the description of *canutifrons* n. sp. in all respects. I see no way to differentiate them and these specimens may not actually belong with the males of *apletomeris*.

Holotype male: Upper Olaa Forest, Hawaii, August, 1952, collected flying in the foliage of *Pipturus hawaiiensis* (W. C. Mitchell). Three male paratypes: two same data as type; and one Keauhou Ranch, Kilauea, Hawaii, July, 1953 (D. E. Hardy). Two female specimens are on hand, same data as type, (W. C. Mitchell and D. E. Hardy); these are not being designated as paratypes.

Type in the Bernice P. Bishop Museum. Paratypes in the United States National Museum and the University of Hawaii.

Pipunculus (*Pipunculus*) *bicuspidis*, new species (fig. 88a–c).

This species fits in the complex which is characterized by having one or more strong erect setae on the outside of the swollen portion of the hind tibia, the abdomen predominantly polished, and the femora with broad, dark brown to black bands. It is differentiated from other species in this group by having a large apical membranous area on the hypopygium (fig. 88b) and by having the claspers short and broad, each with two points at inner apex (fig. 88c). *P. bicuspidis* is closely related to *P. juvator* Perkins but has a long seta on the hind tibia, the male claspers are much broader, and the ninth sternum is more deeply cleft on the hind margin (fig. 88c).

MALE. Head: The compound eyes are joined on the front for a distance equal in length to twelve to fourteen rows of eye facets. The upper portion of the front and the ocellar triangle are polished black, the lower portion is silvery gray pubescent. The face is entirely silvery gray, and is slightly broader than the front just above the antennae. The first two antennal segments are dark brown to black, the third is bright yellow, moderately long acuminate below (fig. 88a). The upper portion of the occiput is shining black in ground color, rather densely gray pollinose. The sides and lower portion are densely gray. The mouth parts are yellow. **Thorax:** Subshining black on the dorsum, rather densely brown pollinose, gray on the sides. The humeri are brownish yellow. The halteres are yellow, tinged with brown at their bases and on the apices. The scutellum has about eight moderately long black setae on the posterior margin, the disc is bare or nearly so. **Legs:** The coxae are dark brown to black covered with gray

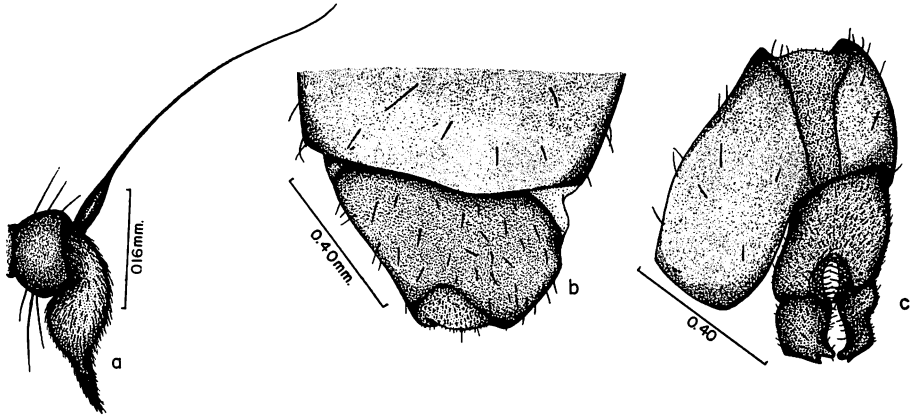


Figure 88—*Pipunculus bicuspidis* n. sp.: a, antenna; b, apex of male abdomen, dorsal; c, male genitalia, ventral.

pollen. The trochanters and tibiae are yellow. The femora are broadly yellow at their bases, narrowly so at their apices; each has a broad, brown to black band occupying most of the apical three-fourths of the segment. Each femur is rather densely gray pollinose, with the exception of a polished area on the posterior surface of each hind pair. Each femur has a row of about eight moderately strong flexor spines extending down the posteroventral and anteroventral surfaces, and a row of conspicuous posterodorsal hairs is present on each of the front two pairs. The tarsi are yellow, except for a tinge of brown extending down the dorsal surfaces. Each hind tibia has one strong, erect seta on the outside of the swollen portion; this is nearly two times longer than the width of the tibia. *Wings*: Almost hyaline, very faintly infuscated. The third costal section is about equal in length to the fourth and the stigma occupies all of the third section. The third and fourth costal sections combined are about one-fifth longer than the fifth costal section. The r-m crossvein is situated near the basal third of cell 1st M_2 and the last section of vein M_{1+2} is slightly curved. The last section of vein M_{3+4} is about equal in length to the m crossvein. *Abdomen*: The first tergum is densely gray pollinose and has a row of six to eight moderately long black hairs on each side. The second tergum is entirely gray-brown pollinose. The basal half of the third tergum is pollinose, the apical half is polished black. The fourth tergum is polished except for a thin pollinose band along the basal edge. The fifth tergum is entirely polished black. The male hypopygium is almost as long as the fifth abdominal segment and has a large conspicuous apical membranous area (fig. 88b); this completely bisects the eighth segment as seen from a ventral view. The ninth tergum is approximately as long as wide, and has a U-shaped cleft in the middle of the hind margin which extends approximately one-half the length of the segment. The claspers are broad, almost quadrate in shape; each has two points at the inner apex (fig. 88c).

Length: body, 4.0 mm.; wings, 5.4 mm.

FEMALE. Unknown.

Holotype male: Kokee, Kauai, 3,600 ft. elevation, collected hovering in foliage of *Osmanthus sandwicensis*, July, 1952 (D.E. Hardy).

Type in the Bernice P. Bishop Museum.

Pipunculus (Pipunculus) canutifrons, new species (fig. 89a-e).

This species fits near *P. trichostylis* n. sp. but the genitalia of both sexes are very differently developed in these species (figs. 88c, 89b, 117d, and 117e). The females fit near *P. delomeris* n. sp. but differ by having the front entirely gray.

MALE. *Head*: The occiput is subshining brownish gray on the upper portion, gray on the sides. The eyes are joined on the front for a distance equal to about two times the length of the lower portion of the front. The first two antennal segments are dark brown, the third segment is yellow, long acuminate below, rather similar to the figure of the antenna of *macrothrix* n. sp. (fig. 102a). *Thorax*: Subshining, dusted with brown on the dorsum, gray on the sides. The dorsocentral hairs are fine and inconspicuous. The scutellum has about six moderately strong bristles on the hind margin, the longest bristle almost one-half as long as the scutellum. The humeri are dark brown to black, faintly tinged with yellow around the hind margin. The halteres are yellow, tinged with brown on the knobs. *Legs*: The coxae are black; the femora are predominantly black, yellow at their apices and bases. The trochanters are yellow, the tibiae entirely yellow except for a tinge of brown on the anterior surface of the hind tibia near the apical fourth of the segment. Flexor spines and extensor hairs are moderately developed on all femora. The hind femora are polished black on the posterior surfaces. The hind tibia of the type is rather strongly arcuate (fig. 89a), and one strong erect bristle is situated in the middle of the swollen portion. *Wings*: Evenly infuscated, the stigma is brown and fills all of the third costal section. The third section is approximately half as long as the fourth and the two sections combined are about one-fourth longer than the fifth costal section. The r-m crossvein is situated at the basal third of cell 1st M_2 and the last section of vein M_{1+2} is gently curved. Vein $Cu_1 + 1st A$ is equal or slightly longer than the m-cu crossvein and about two-thirds as long as the last section of vein M_{3+4} . *Abdomen*: The first tergum is gray, the second and third are brown pollinose except for a narrow polished stripe across the posterior margin of the segment. The fourth tergum is entirely polished black except for a narrow brown pollinose band across the basal margin. The fifth tergum is entirely polished black. The abdomen is sparsely covered with short, inconspicuous setae. The hypopygium is small, rather inconspicuous, about one-half as long as the fifth abdominal tergum, and has a membranous area on the right side, as seen from a dorsal view (fig. 89b). The claspers are slender, straight-sided, blunt at apices (fig. 89d). From the left side the genitalia are as in figure 89c. From a ventral view, the membranous area does not completely bisect the eighth segment. The ninth

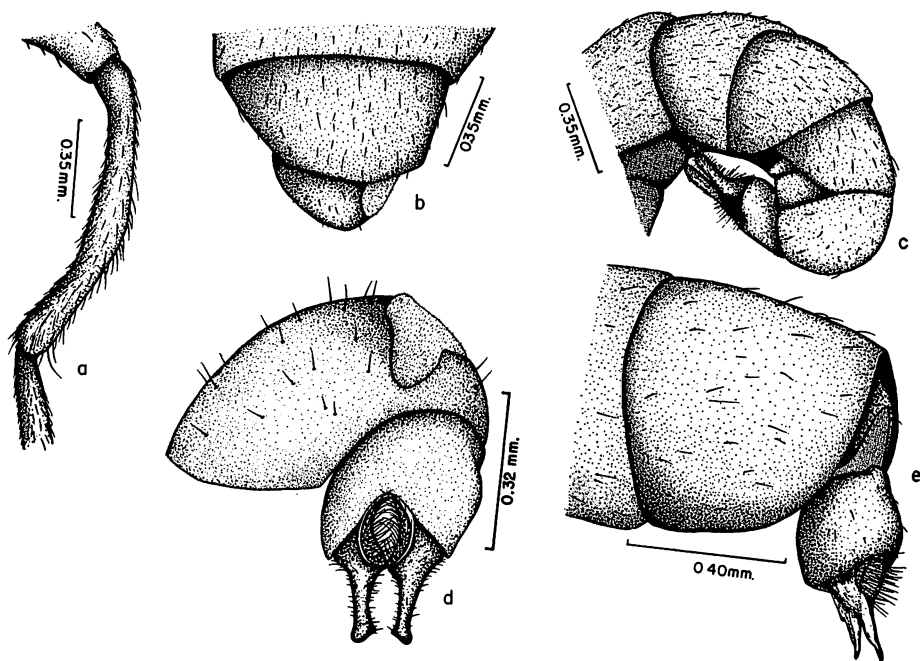


Figure 89—*Pipunculus canutifrons* n. sp.: a, hind tibia of male; b, apex of male abdomen, dorsal; c, male abdomen, left side; d, male genitalia, ventral; e, female ovipositor, lateral.

segment is slightly wider than long and has a moderate concavity on the posterior margin.

Length: body, 4.0 mm.; wings, 6.5 mm.

FEMALE. The front is entirely gray pollinose, distinctly expanded on the upper half. The occiput is gray except for a brownish black area immediately behind the ocellar triangle. The mesonotum is gray-brown, more distinctly pollinose than in the male. The hind tibia is slightly arcuate and has one or two strong black setae on the outside of the swollen portion. The abdomen is entirely gray pollinose, subshining on the dorsal portion of the fifth tergum. The sixth tergum is narrow, completely hidden from dorsal view, and with a deep V-shaped cleft in the middle of the hind margin. The ovipositor is short, inconspicuous, often hidden by the sides of the fifth tergum. The ovipositor extends to about the base of the fifth segment (fig. 89e).

Length: body, 4.4 mm.; wings, 6.5 mm.

Holotype male: Kulani, Hawaii, 5,200 ft., August, 1952, collected on *Pipturus hawaiiensis* in association with a *Nesophrosyne* sp. (W. C. Mitchell). **Allotype female** and ten paratypes, all females: same data as type (W. C. Mitchell and D. E. Hardy); 29 Miles, Olaa, Hawaii, flying over ferns, July, 1923, (W. M. Giffard); and upper Olaa Forest, Hawaii, 4,000 ft. on *Pipturus*, July, 1956 (D. E. Hardy).

Type, allotype, and two paratypes in the Bernice P. Bishop Museum. The remainder of the paratypes are in the collections of the United States National Museum, the University of Hawaii, the British Museum (Natural History), and the Hawaiian Sugar Planters' Association.

Pipunculus (Pipunculus) chauliosternum, new species (fig. 90a-c).

This species shows rather close relationship to *P. proditus* n. sp. but is easily differentiated by the striking differences in the male genitalia, especially the development of the claspers, and in the development of the anterior margin of the fifth sternum (fig. 90c).

MALE. *Head*: The eyes are joined for a distance equal to 1.3–1.5 times the length of the lower portion of the front. The first two antennal segments are predominantly brown, tinged faintly with yellow. The third segment is yellow, tinged with brown, and is moderately acuminate below (fig. 90a). *Thorax*: Subshining black, covered with brown pollen on the dorsum, and gray on the sides. The scutellum has six or eight moderately long hairs on the hind margin. The humeri are brown, tinged with yellow around the margins. The halteres are predominantly yellow, tinged with brown at their bases and their apices. *Legs*: The trochanters, tibiae, broad bases and apices of femora, and most of the tarsi, are yellow. The coxae are dark brown to black, covered with gray pollen. Each femur has a broad, dark brown to black band over the middle portion and is covered with gray pollen except for a shining black area extending along the posterior surface of the hind femur. Flexor spines and extensor hairs are moderately developed on all legs. The hind tibia has one to three erect setae on the outside of the swollen portion. *Wings*: Faintly infuscated. The third costal section is about equal in length to the fourth and the two sections combined are approximately one-third longer than the fifth costal section. The r-m crossvein is situated near the basal third of cell 1st M² and the last section of vein M₁₊₂ is gently curved. The petiole of the cubital cell is almost equal in length to the m-cu crossvein. *Abdomen*: Terga four and five each have a narrow pollinose band extending across the base and are otherwise polished black. The apical third to one-half of the third tergum is polished, the basal portion of the abdomen is pollinose. Ten to twelve hairs are present on each side of the first abdominal tergum. The fifth abdominal segment is about equal in length to the fourth. The posterior portion of the abdomen is rather thickly setose; the hairs are longer, more conspicuous than is normal. The hypopygium is about two-thirds as long as the fifth and has the membranous area confined to the right side (fig. 90b). From a ventral view the membranous area is very narrow and does not completely bisect the eighth segment. The ninth segment is about as wide as long. The claspers are narrow and slightly enlarged at apices. Both the fourth and the fifth sterna are produced into an anteriorly projecting point (fig. 90c).

Length: body, 4.0 mm.; wings, 6.0 mm.

FEMALE. Resembling *P. acrothrix* Perkins because of the conspicuous long

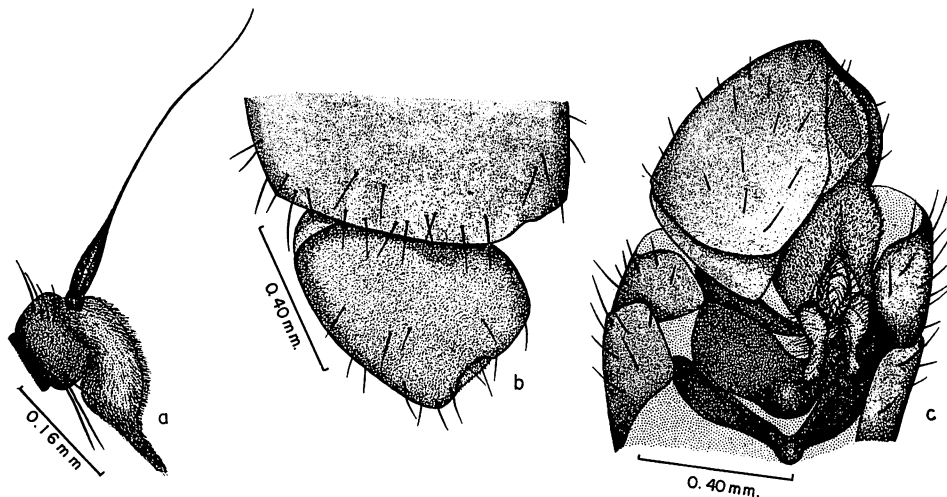


Figure 90—*Pipunculus chauliosternum* n. sp.: a, antenna; b, apex of male abdomen, dorsal; c, apex of male abdomen, ventral.

setae on the posterior portion of the fifth abdominal tergum. It differs by having the abdomen predominantly pollinose, the third antennal segment yellow-brown, and the front predominantly polished black.

The front of the female is slightly expanded in the median portion, the upper two-thirds is polished black. The lower portion is gray pollinose. The apical portion of the fifth tergum is densely setose and bare of pollen, shining black; the apex of the fourth tergum is sometimes polished. The ovipositor is very tiny, inconspicuous; from a lateral view it is completely invisible except for the protruding tip of the piercer. The sixth abdominal segment, as well as the base of the ovipositor, are hidden by the apical margins of the fifth tergum. The sixth segment is almost completely divided into two lateral lobes by a deep cleft on the posterior margin. The piercer is short and straight, about equal in length to its base, and extends approximately to the apex of the third abdominal segment. The sides of the terga almost overlap on the venter, covering over the base of the ovipositor and the basal portion of the piercer.

Length: body, 4.0 mm.; wings, 5.4 mm.

Holotype male and allotype female: Kokee, Kauai, 3,600 ft. elevation, collected flying in the foliage of *Osmanthus sandwicensis*, July, 1952 (D. E. Hardy). Eight paratypes (two males and six females) from the following localities on Kauai: Kainamanu, 3,800 ft., July, 1952 (D. E. Hardy); Waialae Stream, 3,600 ft. (D. E. Hardy); and Kaunuohua Ridge, 4,000 ft., August, 1953 (D. E. Hardy).

The type and allotype are in the Bernice P. Bishop Museum; the paratypes are in the collections of the United States National Museum and the University of Hawaii.

Pipunculus (Pipunculus) cornutus (Hardy) (fig. 91a-d).

Dorilas (Dorilas) cornutus Hardy, 1953, Proc. Haw. Ent. Soc. 15 (1):60, fig. 2a-d.

Endemic. Oahu (type locality: Mt. Tantalus).

Type in the United States National Museum.

Hosts. Unknown. Specimens have been taken flying over sword fern (*Nephrolepis* sp.).

This species appears rather closely related to *P. obscuratus* (Hardy) but the genitalia of both sexes are distinctly different as shown in figures 91c, 91d, and 107c. The third costal section is also distinctly longer in *cornutus*, and the front of the female is highly polished.

MALE. The antennae are almost entirely yellow. The first segment is brown, the second is faintly tinged with brown. The third segment is moderately acuminate (fig. 91a). The mesonotum is entirely dusted with gray-brown pollen. About eight moderately strong hairs are present on the hind margin of the scutellum; the longest of these is almost half as long as the scutellum. The legs are entirely pale yellow except for the brownish colored coxae and except for a tinge of brown on the apices of the tarsi. The femora are rather slender and the flexor spines are well developed. Each hind tibia has two or more strong setae on the outside of the swollen portion. The wings are slightly fumose; the stigma is brown and fills all of the third costal section. The third section is one-half to three-fourths as long as the fourth costal section and the third and fourth combined are slightly longer than the fifth section. The r-m crossvein is situated at the basal third of cell 1st M_2 and the last section of vein M_{1+2} is gently curved. The first tergum is entirely gray, the second is gray-brown pollinose. The third tergum is dusted with brown on the basal three-fourths and polished to subshining black on the apical portion. The fourth tergum is dusted with brown on the basal one-third to one-half and polished black on the apical portion. The fifth tergum is entirely polished black. The hypopygium is about as long as the fifth abdominal segment and has a large membranous area covering the entire right side of the apex (fig. 91b). As seen from a ventral view the membranous portion almost completely bisects the eighth segment. The ninth segment is about as wide as long and has a moderate U-shaped concavity in the middle of the hind margin. The claspers are short and broad, about one-half longer than wide, nearly truncate at apices, and slightly pointed on the inner apices (fig. 91c).

Length: body, 3.64 mm.; wings, 5.30-5.60 mm.

FEMALE. The antennae are more acuminate than in the male. The upper half of the front is polished black, the lower portion is silvery pubescent. The front is slightly expanded above the median portion. The abdomen is entirely opaque, gray-brown pollinose. The sixth segment is poorly developed and is scarcely one-third as long as the fifth segment. The piercer is short and extends almost to the base of the fifth abdominal segment. The base of the ovipositor is

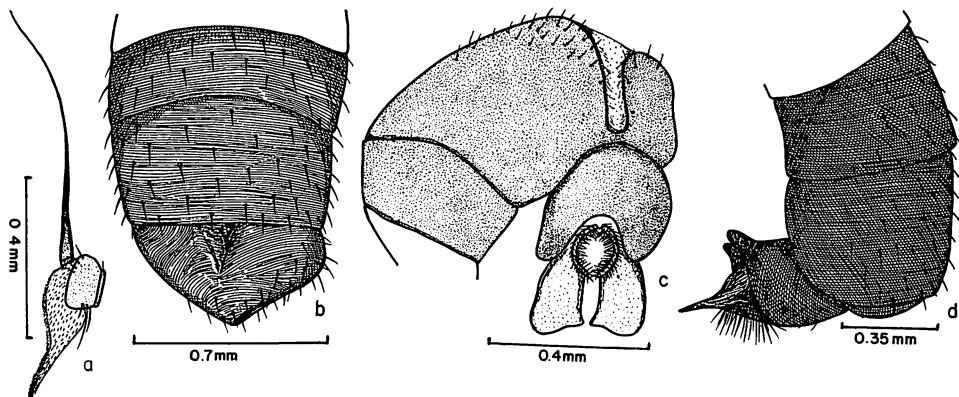


Figure 91—*Pipunculus cornutus* (Hardy): a, antenna; b, apex of male abdomen, dorsal; c, male genitalia, ventral; d, female ovipositor.

entirely black and a pair of strong horn-like tubercles is developed on the under-side (fig. 91d).

Length: body, 4.0 mm.; wings, 5.0 mm.

***Pipunculus (Pipunculus) delomeris*, new species (fig. 92a–d).**

This species superficially resembles *P. meqameris* n. sp., and the two species apparently occur in the same environment. *P. delomeris* is differentiated by having the fourth and fifth sterna produced into anteriorly projecting points and the sixth tergum of the male situated posterior to the fifth (fig. 92b). The male genitalia also differ in the two species. In *delomeris*, the eighth segment is not polished on the right side, the ninth segment is not so enlarged, and the claspers are differently shaped (fig. 92d). The female specimens fit very close to *P. uluhe* (Hardy) and may be difficult to separate. They apparently differ by having the femora almost all-black and the tibiae discolored with brown to black in the median portions.

MALE. Head: The junction of the compound eyes is one-third to one-half longer than the lower portion of the front. The lower front is entirely silvery gray pubescent. The upper portion of the occiput is subshining black, lightly brown dusted, the lower portion is gray. The first two antennal segments are dark brown to black, the third segment is yellow and long acuminate below (fig. 92a). **Thorax:** Shining black in ground color, gray on the sides, lightly dusted with brown on the dorsum. The scutellum has six to eight moderately long bristles on the hind margin; the longest seta is about two-fifths the length of the scutellum. The disc of the scutellum is nearly devoid of setae. The dorsocentral hairs are moderately developed and conspicuous as seen in lateral view. The humeri are black. The knobs of the halteres are tinged with brown. **Legs:** Predominantly black, yellow on the apices and bases of femora and tibiae. Flexor

spines and extensor hairs are moderately developed on the femora. The hind tibia has three strong, erect setae on the outside of the swollen portion. *Wings*: Lightly infuscated, the stigma is brown and fills all of the third costal section. The third costal section is slightly shorter than the fourth and the two combined are just slightly longer than the fifth costal section. The r-m crossvein is situated near the basal third of cell 1st M_2 and the last section of vein M_{1+2} is gently curved. The last section of vein M_{3+4} is almost equal in length to the m crossvein and the last section of $Cu_1 + 1st A$ is about equal in length to the m-cu crossvein. *Abdomen*: Predominantly polished black, lightly dusted with gray-brown over terga two to four and over the median portion of five. The first tergum is gray. The anterior border of the tergum is lined with a row of black hairs except for a space in the median portion; these hairs diminish in size on the dorsum and are longest on the sides. The hypopygium is approximately equal in length to the fifth abdominal segment, is entirely dusted with gray-brown pollen, is rounded on the left side (fig. 92c), and has a conspicuous longitudinal seam on the right (visible only in lateral view). From a ventral view, the ninth segment is longer than wide and has a V-shaped cleft extending about one-third the length of the segment. The claspers are short, rather irregular in shape (fig. 92d), and bent downward apically so that the tips are difficult to see in direct ventral view. The fourth and fifth sterna each has an anteriorly projecting lobe in the middle (fig. 92b).

Length: body, 5.25 mm.; wings, 6.20 mm.

FEMALE. Fitting the description of *P. uluhe* (Hardy) in most respects; differing by having the femora almost entirely black and the tibiae typically discolored with brown to black over the median portion. The abdomen is entirely subshining rather faintly dusted with gray pollen. The sixth abdominal segment is small; from a direct dorsal view it is about one-sixth as long as the fifth segment. As seen from end view the sixth segment has a deep concavity on the posterior margin. The ovipositor base is globose; the piercer is short and straight, extending almost to the base of the fourth abdominal segment when in resting position. The ventral portion of the ovipositor is hidden from view on the type. On a paratype specimen from Puu Kolekole (which is slightly aberrant since the tibiae are all yellow except for a very slight discoloration on the hind pair) the ovipositor has a small basal tubercle on each side and also a median tubercle directly ventral to the vulva.

Length: body, 4.8 mm.; wings, 6.3 mm.

Holotype male: Pepeopae, Molokai, 4,000 ft., July 30, 1959 (D. E. Hardy). Allotype female: taken above Waikolu Valley, 1,400 m., Molokai, April 30, 1955 (C. R. Joyce). Six paratypes (five males and one female) from the following localities on Molokai: same as type; Waikolu Valley, 1,400 m., May 1, 1955 (C. R. Joyce); Puu Kolekole, July 30, 1959 (D. H. Habeck and D. E. Hardy); Kawela, December 12, 1956 (J. W. Beardsley). Also one male paratype from Ridge S. Iao Valley, Maui, September 14, 1919 (F. X. Williams).

The type and allotype are being deposited in the Bernice P. Bishop Museum.

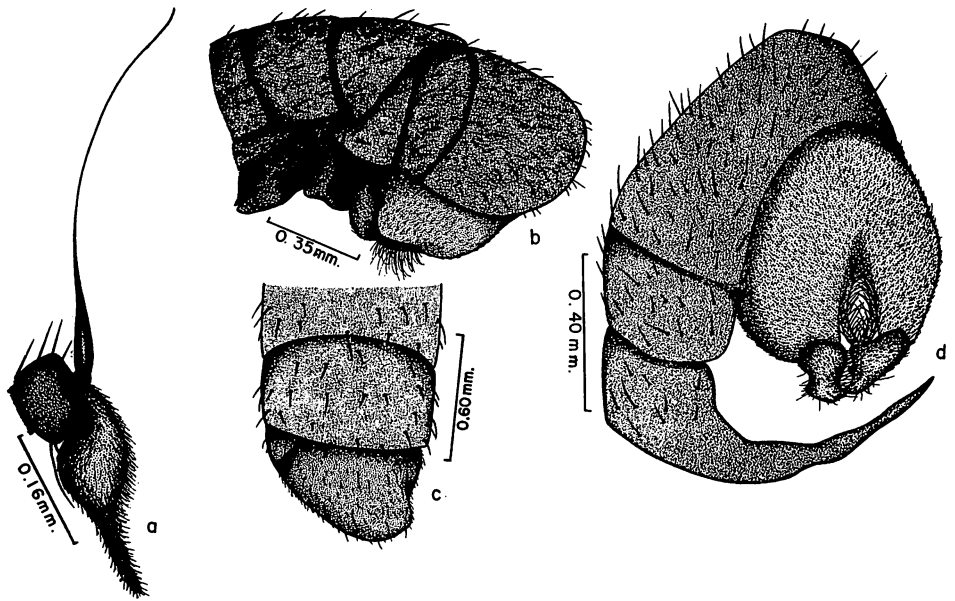


Figure 92—*Pipunculus delomeris* n. sp.: a, antenna; b, male abdomen, left lateral; c, apex of male abdomen, dorsal; d, male genitalia, ventral.

The paratypes are in the following collections: United States National Museum, British Museum (Natural History), Hawaiian Sugar Planters' Association, and the University of Hawaii.

***Pipunculus* (*Pipunculus*) *euryhymenos*, new species (fig. 93a-c).**

This species is similar in most respects to *P. timberlakei* (Hardy) but is differentiated by the very large membranous area which covers the entire right side of the eighth segment of the male; by the long acuminate third antennal segment; by the broad yellow bases on the femora; by the moderately long marginal bristles on the scutellum; and by the conspicuously setose apex of the abdomen.

MALE. Head: The junction of the compound eyes is one-half to two-thirds longer than the lower portion of the front. The upper half of the occiput is subshining black; the lower half is gray pollinose. The antennae are entirely dark brown to black, the third segment drawn out into a long slender point ventrally (fig. 93a). **Thorax:** Subshining black, dusted with brown on the dorsum, gray on the sides. The dorsocentral hairs are fine, inconspicuous. About eight moderately large black bristles are present on the hind margin of the scutellum, the longest of these about one-half the length of the scutellum. The halteres are yellow with a faint tinge of brown on the apices. **Legs:** The femora are predomi-

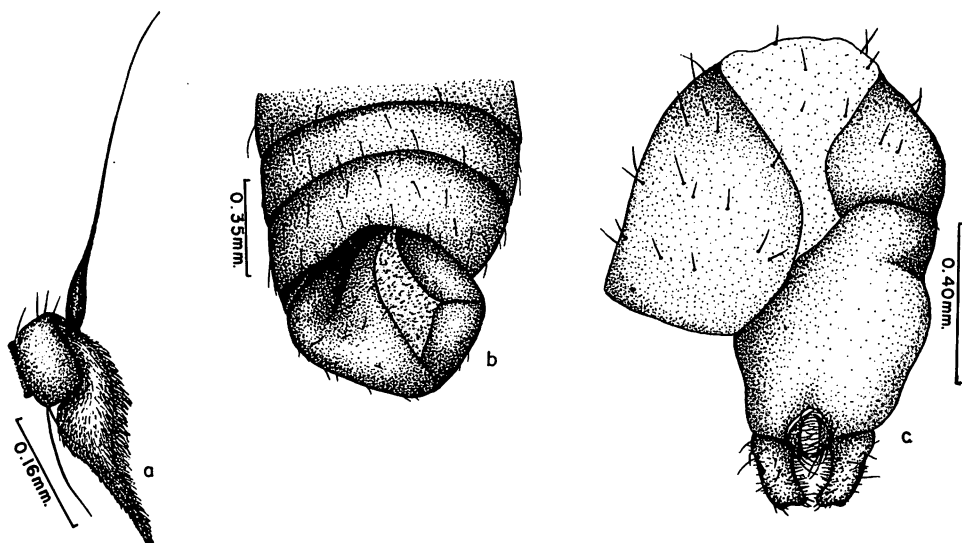


Figure 93—*Pipunculus euryhymenos* n. sp.: a, antenna; b, apex of male abdomen, dorsal; c, male genitalia, ventral.

nantly brown to black, with broad yellow bases and apices. The tibiae are yellow, the tarsi are tinged with brown on the dorsal surfaces. The posterior surfaces of the hind femora are polished. Flexor spines and extensor hairs are moderately developed on all femora. No erect setae are present on the hind tibiae. **Wings:** The apical two-thirds is slightly infuscated, the basal portion is almost hyaline. The stigma is just slightly darker than the wing membrane and fills all of the third costal section. The third section is equal or slightly longer than the fourth and the two sections combined are about equal in length to the fifth costal section. The r-m crossvein is situated near the basal third of cell 1st M_2 and the last section of vein M_{1+2} is gently curved. Vein $Cu_1 + 1st A$ is about two-thirds to three-fourths as long as the m-cu crossvein. **Abdomen:** The first tergum is gray pollinose and has about six black bristles on each side. Terga two to four are subshining black, covered with brown pollen. The fifth tergum is predominantly polished black, lightly brown pollinose at its base. The hypopygium is large, distinctly longer than the fifth segment; the membranous area covers the entire right side as seen from dorsal view (fig. 93b). As seen from a ventral view the membranous area on the eighth segment is very extensive, covering all of the right side of the apex and bisecting the eighth segment. The ninth segment is slightly longer than wide, the cleft on the posterior margin is shallow (fig. 93c). The claspers are stout, about two times longer than wide, truncate at apices, and slightly pointed on the dorsal edge.

Length: body, 5.4 mm.; wings, 6.4 mm.

FEMALE. Fitting the description of the male in most respects and very similar to *timberlakei* (Hardy). The front is predominantly gray, the upper one-fourth is polished black. The third antennal segment is yellow-brown. The abdomen is predominantly gray, the fifth segment is subshining black. The sixth tergum is short, inconspicuous in dorsal view, and with a rather deep V-shaped cleft on the hind margin. The ovipositor is short, rather inconspicuous in natural position; the piercer is shorter than the base and the basal portion is slightly tuberculate ventrally.

Length: body, 4.0 mm.; wings, 5.5 mm.

Holotype male: Alakai Swamp, Kauai, 3,800 ft., July, 1952 (D. E. Hardy). Allotype female: Kaunuohua Ridge, Kauai, 4,000 ft., August, 1953 (D. E. Hardy). Four paratypes (two males, two females): same data as allotype.

Type and allotype in the Bernice P. Bishop Museum. Paratypes in the United States National Museum and the University of Hawaii.

Pipunculus (Pipunculus) filicicolus, new species (fig. 94a-e).

This species shows rather close resemblance to *P. swezeyi* Perkins but is differentiated by having the abdomen of the male predominantly polished black, the male hypopygium with a conspicuous apical membranous area, and the femora slightly discolored with brown. The ninth sternum is not so elongate, is more deeply cleft in proportion to its length, and the male claspers are much differently shaped (compare figures 94d and 113c). The females are similar to those of *alienus* (Hardy) but the pad-like developments on the underside of the apex of each mid and front tibia are distinctive.

MALE. Head: The junction of the compound eyes is about one-half longer than the lower portion of the front. The lower front and the face are densely silvery gray pubescent. The clypeus is subshining black, covered with gray pollen. The palpi and mouthparts are yellow. The occiput is almost entirely gray pollinose, gray-brown only on the upper portion behind the ocellar triangle. The first two antennal segments are brown, tinged faintly with yellow. The third segment is bright yellow, short acuminate ventrally (fig. 94a). **Thorax:** Subshining black, dusted with brown on the dorsum, gray on the sides. The humeri are brown, tinged with yellow. The knobs of the halteres are brown, the stems are yellow. The pleura have a faint tinge of yellow in the ground color; this is especially noticeable on the sternopleura and the lower posterior portions of the mesopleura. The metanotum is densely gray pollinose. The scutellum has about eight short setae on the hind margin. **Legs:** Almost entirely yellow. The coxae are brown, covered with gray pollen. The middle and hind femora each have a small discoloration of brown extending over the dorsomedian portion. About five short, black spines are present near the apical third of the front and hind tibiae on each of the posteroventral and anteroventral surfaces. The flexor spines on the middle tibia extend over about the apical two-thirds of the segment. The front tibia has a densely yellow pubescent area extending down the

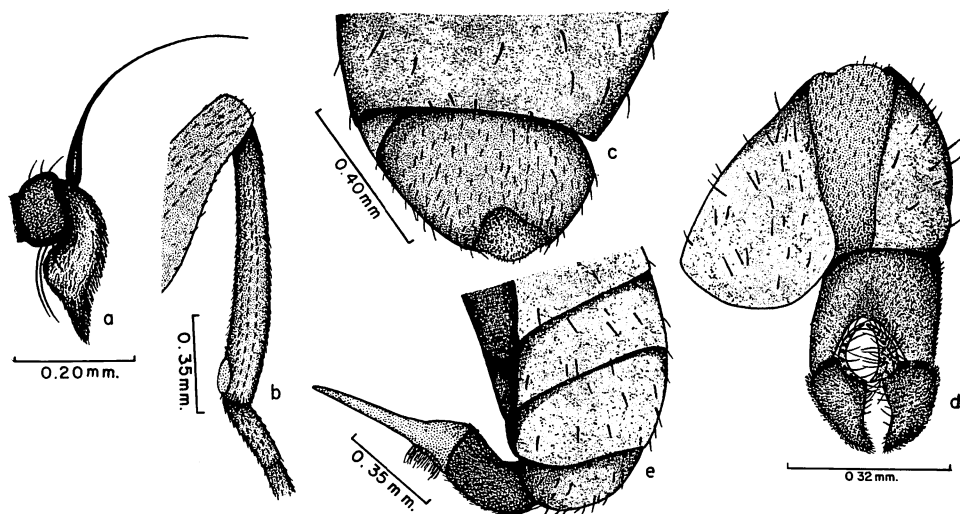


Figure 94—*Pipunculus filicicolus* n. sp.: a, antenna; b, middle tibia of female; c, apex of male abdomen, dorsal; d, male genitalia, ventral; e, female ovipositor.

anteroventral surface; the pad-like developments present on the front and middle tibiae of the female are not present on the male. *Wings*: Faintly infuscated, especially on the apical two-thirds. Third costal section approximately equal in length to the fourth; the stigma is dark brown and fills all of the third costal section. The third and fourth costal sections combined are approximately one-fourth longer than the fifth section. The r-m crossvein is situated at the basal third of cell 1st M_2 . The last section of vein M_{1+2} is gently curved. *Abdomen*: Terga four to five are entirely polished black. The first tergum is densely gray pollinose; four or five moderately long hairs are present on each side. The hypopygium is about four-fifths as long as the fifth segment and has an apical membranous area (fig. 94c); this is rather small as seen from dorsal view. As seen from a ventral view the membranous area completely bisects the eighth segment. The ninth segment is slightly wider than long; the cleft on the hind margin extends half the length of the segment. The claspers are gradually tapered, pointed at apices (fig. 94d).

Length: body, 5.0–5.2 mm.; wings, 6.5–6.7 mm.

FEMALE. Abdomen subshining, lightly dusted with gray-brown pollen. Each front and middle tibia has a yellow, slightly swollen preapical spot or pad-like development on the ventral surface (fig. 94b). The hind two pairs of femora have but a faint tinge of brown on the dorsal surfaces. The sixth abdominal segment is well developed; the tergum is approximately as long as the fifth tergum on a mid-dorsal line. The posterior margin of the sixth tergum is gently concave. The basal portion of the ovipositor is subshining black, the piercer largely yellow, straight, and extending almost to the base of the abdomen (fig. 94e); a small bump is present on each side of the base of the piercer.

Length: body, 4.2 mm.; wings, 5.5 mm.

Holotype male: Mt. Tantalus, Oahu, June, 1953, flying over sword fern (*Nephrolepis exaltata* (L. Schott)) (D. E. Hardy); allotype female: same habitat as type, August, 1952 (D. E. Hardy); seventeen paratypes (fifteen males and two females): same habitat as type, collected from June to December, 1952 and 1953 (D. E. Hardy and M. S. Adachi); and Waimano Trail, Oahu, September 28, 1958 (C. M. Yoshimoto).

Type, allotype, and two of the paratypes in the Bernice P. Bishop Museum. The remainder of the paratypes are in the following collections: United States National Museum, British Museum (Natural History), and the University of Hawaii.

One female specimen on hand from Halemanu Valley, Kauai, August, 1953 (D. E. Hardy), is apparently this species. It fits the above description except that the middle and hind femora are more distinctly marked with brown and the ovipositor lacks the small basal tubercles. It is not being designated as a paratype.

Pipunculus (Pipunculus) gnomus, new species (fig. 95a-c).

This species apparently belongs in the *juvator* complex because of the presence of a large membranous area at the apex of the male hypopygium and the absence of strong, erect setae on the hind tibiae. It differs from any known Hawaiian species by its very tiny size and by the genital characters as shown in figure 95b and 95c.

MALE. Head: The junction of the compound eyes is just slightly longer than the lower portion of the front. The occiput is rather narrow, about one-sixth as wide as the compound eyes. The upper half of the occiput is gray-brown pollinose, faintly shining; the lower portion is gray. The first two antennal segments are brown, the third segment yellow, faintly tinged with brown, acute ventrally (fig. 95a). **Thorax:** Subshining black, dusted with gray-brown pollen on the dorsum, gray on the sides. The dorsocentral hairs are inconspicuous. The scutellum has six to eight moderately long, black bristles on the hind margin, the longest bristle about one-half the length of the scutellum. **Legs:** The femora are predominantly brown to black, with broad yellow bases and apices. The tibiae are entirely yellow; the tarsi are tinged with brown on the dorsal surfaces. Flexor spines are moderately developed on all femora. The hind tibiae have no conspicuous erect setae on the outside of the swollen portion. **Wings:** Subhyaline, faintly infuscated. The stigma is pale yellow-brown and fills all of the third costal section. The third costal section is one-half to two-thirds as long as the fourth section. The two sections combined are about one-fourth longer than the fifth costal section. The r-m crossvein is situated at the basal third of cell 1st M_2 and the last section of vein M_{1+2} is moderately curved. Vein $Cu_1 + 1st A$ is about equal in length to the m-cu crossvein. **Abdomen:** Subshining black, dusted with gray-brown pollen, which is lighter on the fifth tergum. The hypo-

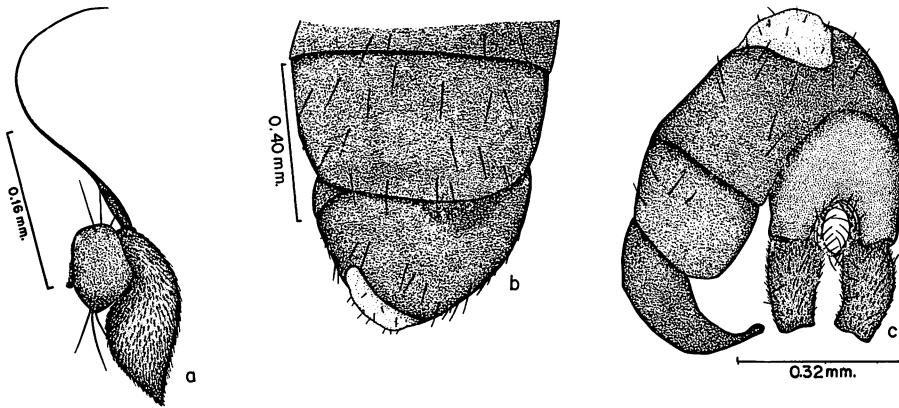


Figure 95—*Pipunculus gnomus* n. sp.: a, antenna; b, apex of male abdomen, dorsal; c, male genitalia, ventral.

pygium is almost as long as the fifth tergum. A large membranous area is present at the apex. In the type the genitalia is pulled out slightly at the base and the membranous area is not visible from a direct dorsal view (fig. 95b). From the ventral view the membranous area covers the entire apex of the eighth segment but does not bisect it on the venter. The ninth segment is about as wide as long and has a shallow U-shaped cleft in the middle of the hind margin. The claspers are rather broad, about two times longer than wide, and quadrate at apices. The sixth tergum is almost as long as the fifth and the anterior margin is developed into a short process on the inner side (fig. 95c).

Length: body, 2.5 mm.; wings, 3.2–3.4 mm.

Holotype male: Kamuela, Hawaii, August 13, 1949 (D. E. Hardy); one male paratype same data as type.

Type in the Bernice P. Bishop Museum. Paratype in the University of Hawaii collection.

***Pipunculus (Pipunculus) haleakalae* (Hardy) (figs. 96 and 97a–d).**

Dorilas (Dorilas) haleakalae Hardy, 1953, Proc. Haw. Ent. Soc. 15 (1):64, fig. 3a–d.

Endemic. Maui (type locality: Haleakala). This species is rather common in the mountains of Maui, and specimens which apparently belong here are on hand from Molokai.

Type in the collection of the Hawaiian Sugar Planters' Association.

Hosts. Unknown. Specimens have been collected flying in the foliage of *Vaccinium reticulatum* Smith and also over various types of ferns.

This species is differentiated from others of the complex which have strong, erect setae on the hind tibiae and which have the femora and antennae predomi-

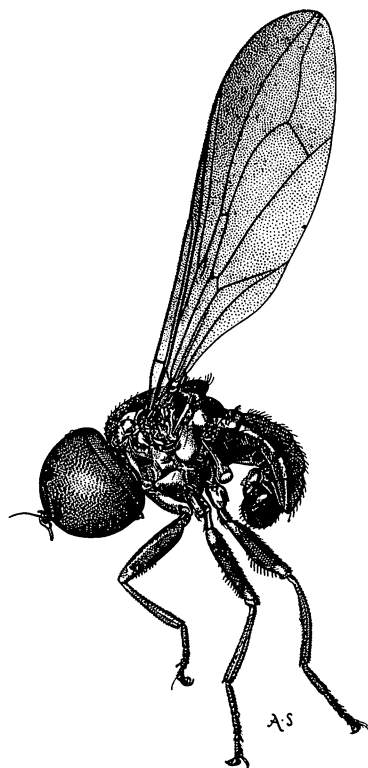


Figure 96—*Pipunculus haleakalae* (Hardy).

nantly black, by the thorax and abdomen entirely pollinose and, also, by the distinctive genital characters as shown in figure 97b and 97c. The females resemble those of *P. proditus* n. sp. but are differentiated by the black antennae, predominantly black femora, and by the difference in the development of the ovipositor (fig. 97d).

MALE. (fig. 96). The antennae are entirely dark brown to black; the third segment is long acuminate (fig. 97a). The thorax is brown pollinose on the dorsum, gray on the sides. Six to eight long, black setae are present on the hind margin of the scutellum, the longest hairs about one-half as long as the scutellum. The femora are black except for narrow yellow apices and bases. The tibiae are entirely yellow and the tarsi are yellow-brown. The flexor spines and extensor hairs are moderately developed on all femora, and the hind tibiae each has three or four long, erect bristles on the outside surface of the swollen portion. The third costal section of the wing is equal or slightly longer than the fourth and the two sections combined are almost as long as the fifth section. The r-m crossvein is situated at the basal third of cell 1st M_2 and the last section of vein M_{1+2} is gently curved. The abdomen is subopaque brown and gray on the first

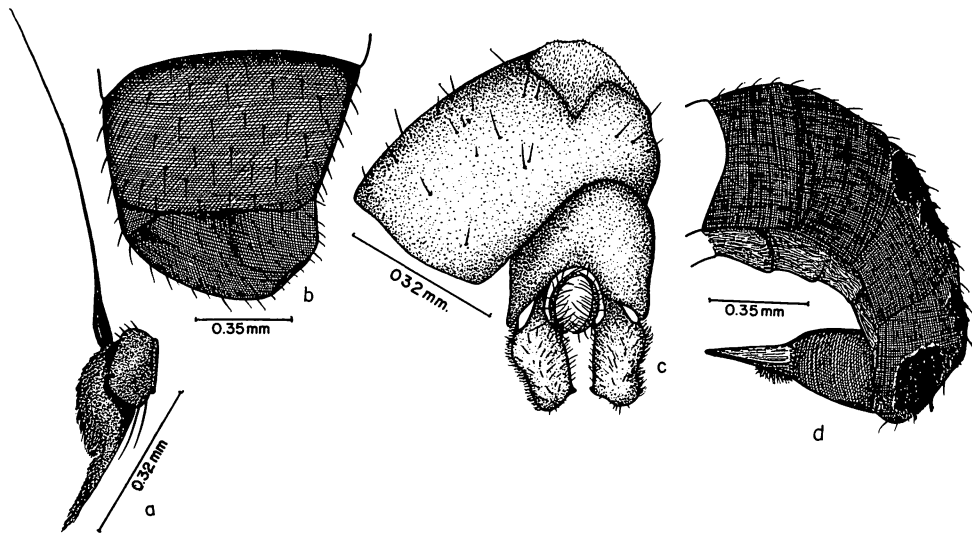


Figure 97—*Pipunculus haleakalae* (Hardy): a, antenna; b, apex of male abdomen, dorsal; c, male genitalia, ventral; d, female abdomen, lateral.

tergum and on the lateral margins. The hypopygium is compressed to the right and has a small subapical membranous area on the right side (fig. 97b). As seen from a ventral view the membranous area covers the right apical portion of the eighth segment. (Notation: This was not correctly shown on the original figure.) The ninth segment is slightly wider than long and has a shallow concavity on the posterior margin. The claspers are broad, almost two times longer than wide, and blunt at apices (fig. 97c).

Length: body, 4.0–5.0 mm.; wings, 5.5–6.3 mm.

FEMALE. Only the upper portion of the front is shining black. The abdomen is entirely gray-brown pollinose. The sixth segment is moderately developed, about half as long as the fifth. The piercer of the ovipositor is straight, equal or slightly longer than its base, and extends to about the apex of the second abdominal segment (fig. 97d).

Length: body, 3.8–4.4 mm.; wings, 5.0–6.0 mm.

***Pipunculus (Pipunculus) hawaiiensis* Perkins (fig. 98a–d).**

Pipunculus hawaiiensis Perkins, 1905, Rept. Expt. Sta. Haw. Sugar Planters' Assn. Bull. 1 (4):155.

Endemic. Hawaii (type locality: Hamakua district). I have seen numerous specimens from the Kilauea section and from Mountain View.

Type in the Bernice P. Bishop Museum.

Hosts. Unknown. Specimens have been collected in association with the plants *Pipturus hawaiiensis* and with *Freycinetia* sp.

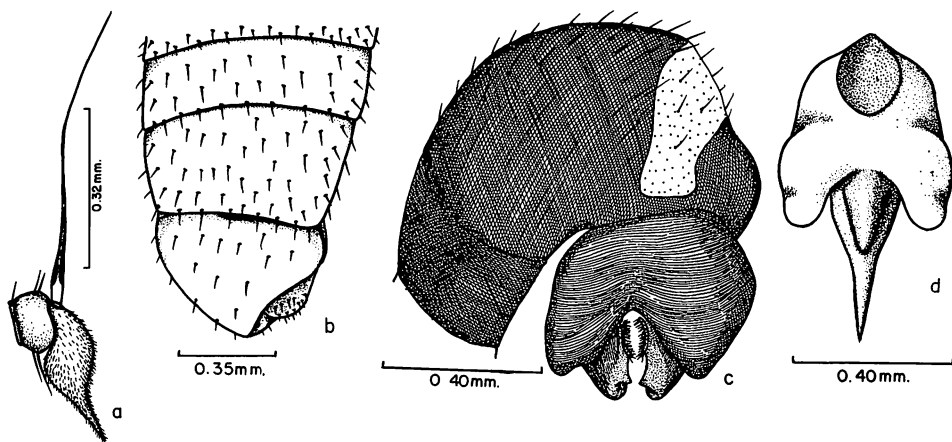


Figure 98—*Pipunculus hawaiiensis* Perkins: a, antenna (drawn from type male); b, abdomen of male, dorsal (from type); c, male genitalia, ventral; d, female ovipositor, ventral.

This species is readily recognized by the all-yellow legs, in combination with the presence of strong, erect setae on the hind tibiae; by the all-pollinose abdomen; and by the unusual development of the male genitalia as shown in figure 98c. The species resembles *P. swezeyi* Perkins, but the latter species lacks the strong setae on the outside surface of each hind tibia and the genitalia are distinctly different.

Following is a redescription of the type male:

The junction of the compound eyes is about equal in length to the frontal triangle. The frontal triangle and the face are densely silvery-gray pubescent; the ground color is completely hidden except for a small faintly shining black spot in the middle of the front. The upper part of the front and the ocellar triangle are shining black. The vertex and the upper portion of the occiput are subshining, lightly gray pollinose; the lower occiput is densely gray. The face is slightly wider than the broadest portion of the face. The antennae are bright yellow (except for the brown first segment), densely pale yellowish pubescent, and long acuminate below; the attenuated apical portion is two-thirds as long as the remainder of the third antennal segment (fig. 98a). The bristles on the underside of the second segment extend about halfway to the apex of the third antennal segment. The mesonotum is brownish gray pollinose on the dorsum, gray on the sides. The dorsocentral and marginal hairs are well developed and erect. The humeri are black. The scutellum is subshining, grayish brown pollinose, with eight strong, black bristles on the hind margin; these bristles are about half as long as the scutellum. The pleura are chiefly black in ground color and are densely gray pollinose. The tegula, anterior basalar sclerite, and some of the small sclerites around the base of the wings are yellow. The subalar sclerite, directly below the wing base, is black. The stems of the halteres are yellowish, the knobs are black. The posterior tibiae each has a row of about

four strong erect bristles on the outside surface of the swollen portion. The legs are entirely yellow except for the brown to black coxae and brownish apical subsegments of the tarsi. The flexor spines are strong on all femora. The extensor hairs are strong only on the middle femora. The hind trochanters have fine yellow pile beneath and the middle pair has a pair of rather strong black bristles at apices above. The middle coxae have a row of strong black bristles at their apices above. The wings are rather lightly fumose; the stigma is dark brown and fills all of the third costal section. The third section is about half as long as the fourth, and the fifth section is just slightly longer than the combined lengths of the third and fourth sections. The r-m crossvein is situated at the basal third of cell 1st M_2 and the ultimate section of vein M_{1+2} is moderately curved. The abdomen is chiefly opaque, rather densely covered with brownish pollen on the dorsum and gray on the sides and on the entire first tergum, basal margin of second, and apical portion of the fifth tergum. The fifth tergum is more thinly pollinose than the remainder of the abdomen and the shining black ground color shows through. The first tergum has a row of about six black hairs on each side. The remainder of the abdomen is covered with rather abundant short, erect, brown setae. The sides of the abdomen are slightly rounded, it is broadest at segments three to four. The hypopygium is about equal in length to the fifth abdominal segment, compressed to the right, and has a large subapical membranous area on the right side (fig. 98b). As viewed from above, the genitalia are grayish pollinose, lightly subshining black. The seventh tergum is scarcely visible from a dorsal view and the sixth is ventral in position, not visible from above. The ninth segment is sometimes visible, on the right side, in dorsal view. It is reddish brown to black in color and has a U-shaped cleft about one-third its length on the posterior margin. The claspers are short and broad. They are rather similar in shape and are rounded at their apices. A small pointed lobe is present just below the apex on the inner side of each clasper (fig. 98c). The membranous area covers all of the right side of segment eight and extends over the ventral portion nearly to the base of the ninth segment. On its posterior margin the membranous area is equal in breadth to both claspers combined. (Note: The details of the ventral aspects of the genitalia were based upon homeotypic specimens.)

Length: body, 4.0–5.0 mm.; wings, 5.5–6.5 mm.

In the female the front is polished black on the upper one-fourth to two-fifths and is densely gray pubescent below. The front is expanded in the median portion and the gibbosity on the lower part of the front is faintly shining black. The front is about equal in width to the face. The legs are as in the male except that the extensor hairs are not so well developed on the middle femora. The hind tibiae have two strong yellow bristles on the outside surface. The abdomen is rather densely pollinose, faintly shining in strong lights, largely brownish colored above and gray on the sides and on the first tergum. Sides of abdomen straight or nearly so, slightly broadest at segment five. The ovipositor is short and compact; the piercer is bright yellow and the base is brown. The piercer is

straight, about equal in length to the base (measured from base of vaginal orifice to apex). It is developed into a single strong tubercle on the underside and extends scarcely beyond the base of the fifth abdominal segment. The base of the ovipositor is developed into a pair of strong lobe-like tubercles on the underside (fig. 98d).

Length: body, 4.0–4.5 mm.; wings, 5.5–6.0 mm.

Pipunculus (Pipunculus) holomelas Perkins (fig. 99a–b).

Pipunculus holomelas Perkins, 1910, Fauna Hawaiiensis 2 (6) :698.

Endemic. Molokai (type locality: given only as "Molokai") and Maui. I have homeotypic specimens on hand which compare perfectly with the type from the following localities on Maui: Olowalu, 1,200 to 1,300 ft., March 24, 1908 (W. M. Giffard); Puu Kukui, circa 4,000 ft., June, 1953 (C. R. Joyce); Nahiku, no date or collector given; and Haleakala, 2,000 ft., no date or collector given.

Type in the Bernice P. Bishop Museum.

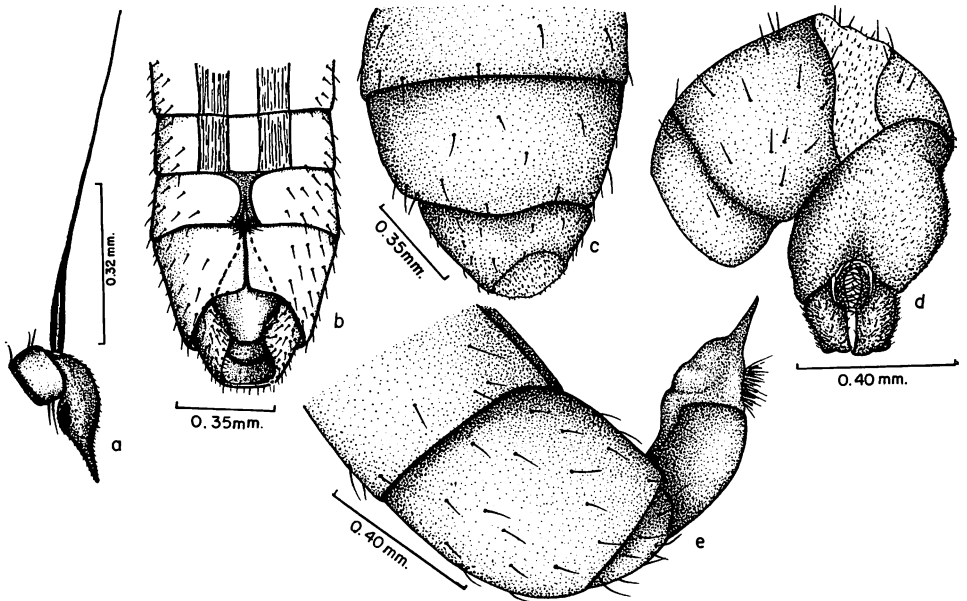


Figure 99—*Pipunculus holomelas* Perkins: a, antenna (from type female); b, abdomen of female, ventral. *P. injectivus* n. sp.: c, apex of male abdomen, dorsal; d, male genitalia, ventral; e, female ovipositor, lateral.

This species is known only from the female; the males have not definitely been associated. It appears to be related to *P. meqameris* n. sp. and to *P. oahuensis* Perkins but is differentiated by having the mesonotum, scutellum, and

the abdomen predominantly polished black and the r-m crossvein situated just before the middle of cell 1st M_2 ; also the tiny, inconspicuous ovipositor of the female appears to be distinctive (fig. 99b).

Following is a redescription of the type:

FEMALE. Front almost entirely polished black, lower one-third gray pollinose. The front is expanded above and is gradually narrowed on the lower portion; at its broadest point it is nearly two times wider than it is just above the antennae. The vertex and the upper occiput are polished black; the lower portion of the occiput is gray pollinose. The antennae are dark brown to black, the third segment is moderately long acuminate (fig. 99a). The thorax is chiefly polished black; only the pleura and sides of the mesonotum are lightly gray pollinose, otherwise it is bare of pollen. The dorsocentral and marginal hairs on the dorsum are distinct but short. The scutellum has six to eight short bristles on its hind margin and has numerous short hairs scattered over the disc; the longest hairs on the margin are one-third to one-fourth as long as the scutellum. The humeri are black and the halteres are yellow to rufous with slight brownish discolorations on their knobs. The legs are almost entirely dark colored, brown to black; very narrowly yellowish on the joints and slightly yellowish beneath the tarsi. The tibiae are not as black as the femora; each has a black band in the middle and is paler brownish red at the apex and base. The hind tibiae each have two strong bristles on the outside surface of the swollen portion. The larger of these two bristles is about three-fourths as long as the first tarsal subsegment. Flexor bristles are well developed on all femora. Extensor hairs are conspicuous but not unusually long. The hind trochanters are densely pubescent below. The wings are lightly smoky; the stigma is brown and does not quite fill all of the third costal section. The third section is one-half to two-thirds as long as the fourth. The two sections combined are about equal in length to the fifth. The r-m crossvein is situated just before the middle of cell 1st M_2 and the last section of vein M_{1+2} is almost straight. The last section of M_{3+4} is about one and one-third to one and one-half times longer than the m-cu crossvein. The abdomen is chiefly polished black. The first tergum is entirely gray and the second tergum is faintly gray-brown pollinose. The abdomen is conspicuously covered with suberect, short setae. The sides are almost straight; it is slightly wider at about segments four and five. The ovipositor is very short and inconspicuous sometimes completely hidden by the coming together on the venter of the lateral margins of the fifth tergum (fig. 99b). The lateral margins of the fourth tergum do not quite meet on the venter and the ovipositor reaches about one-half to three-fourths the distance to the base of the fourth segment. The base of the ovipositor is dark brown to black. The piercer is yellowish and appears to be much shorter than its base. (Note: The ovipositor is so obscured in normal position that it is difficult to study.)

Length: body, 4.5 mm.; wings, 5.5 mm. (Perkins gave the length as 4.0 mm.).

MALE. Unknown.

Pipunculus (Pipunculus) injectivus, new species (fig. 99c-e).

This species fits near *P. trichostylus* and also seems somewhat related to *uluhe* (Hardy). It is readily differentiated by the difference in the development of the male genitalia, the larger, more elongate ninth segment, and the differences in the shapes of the claspers (fig. 99d). The females resemble *uluhe* very closely but differ by having the third antennal segment brown.

MALE. *Head:* The occiput is subshining, dusted with brown on the upper half, gray below. The junction of the compound eyes is nearly two times longer than the lower portion of the front. The first two antennal segments are dark brown, the third segment is brown, tinged faintly with yellow. The third segment is fringed with yellow-gray and is long acuminate ventrally. *Thorax:* Gray on the sides, subshining black, dusted with brown pollen on the dorsum. The dorsocentral hairs are comparatively long and conspicuous. About ten moderately long black hairs are present on the hind margin of the scutellum. The longest is nearly two-thirds the length of the scutellum. *Legs:* The femora are black with yellow bases and apices. The tibiae are entirely yellow, the tarsi are brown on the upper portions. Each hind tibia has two strong anterior bristles on the swollen portion. *Wings:* Subhyaline. The stigma fills the third costal section. The third section is about three-fourths as long as the fourth and the two sections combined are about equal in length to the fifth costal section. The r-m crossvein is situated at the basal one-third of cell 1st M_2 and the last section of vein M_{1+2} is gently curved. Vein $Cu_1 + 1st A$ is about equal in length to the m-cu crossvein. *Abdomen:* The first tergum is gray, a fringe of long black hairs extends along almost the entire anterior margin; this is interrupted narrowly in the median portion. The remainder of the abdomen is predominantly gray-brown pollinose, the fifth tergum is polished black on the apical portion. The hypopygium is almost as long as the fifth abdominal segment and has a large subapical membranous area (fig. 99c). As seen from a ventral view, the membrane completely bisects the eighth segment. The ninth segment is longer than wide and has a shallow concavity on the posterior margin. The claspers are approximately three times longer than wide and are slightly produced on outer apices (fig. 99d).

Length: body, 3.75 mm.; wings, 5.40 mm.

FEMALE. The upper one-half to three-fifths of the front is polished black. The third costal section is about one-half as long as the fourth and the stigma is paler brown than in the male. The abdomen is entirely opaque gray with a faint dusting of brown on the dorsum. The sixth tergum is moderately developed, about one-third to two-fifths as long as the fifth and not concave on the posterior margin. The ovipositor base is oblong; the piercer is short and straight, shorter than the base, and extending approximately to the apex of the third abdominal segment (fig. 99e).

Length: body, 3.9 mm.; wings, 4.5 mm.

Holotype male, allotype female, and two paratypes (one male and one fe-

male): Nauhi Gulch, Hawaii, 5,000–6,000 ft., October 2, 1931 (O. H. Swezey and F. X. Williams).

Type and allotype in the Hawaiian Sugar Planters' Association collection. One paratype in the Bernice P. Bishop Museum and one in the University of Hawaii collection.

Pipunculus (Pipunculus) juvator Perkins (fig. 100a–d).

Pipunculus juvator Perkins, 1905, Rept. Expt. Sta. Haw. Sugar Planters' Assn. Bull. 1 (4):152.

Endemic. Hawaii (type locality: probably Olaa), Maui, Molokai, Oahu, Lanai, and Kauai. One of the most common species over the islands. Type in the Bernice P. Bishop Museum. It contains no locality label. In the original Perkins said, "This is the species referred to me in my Bulletin 'The Leaf-hopper of the Sugar Cane' as occurring at Olaa. It has also been found on Oahu by Mr. Swezey. . ."

Host. Probably *Perkinsiella saccharicida* Kirkaldy (the sugar-cane leafhopper) and obviously other species of leafhoppers. According to Perkins this species used to be common in sugar-cane fields. I have collected specimens in association with *Nephrolepis* and other ferns.

This species is related to *P. terryi* Perkins and is differentiated by its chiefly black femora, the partially polished abdomen of the male, the broad claspers, as well as by other details of the male genitalia (figs. 100c and 114c).

MALE. The third antennal segment is moderately acuminate, the attenuated apical portion is three-fourths as long as the remainder of the third segment (fig. 100a). The third segment is typically brown in color, often tinged with yellow. The eyes are joined for half the length of the front or for a distance about equal in length to the frontal triangle. The face and frontal triangle are dark gray to whitish pubescent. The face is about equal in width to the lower part of front. The occiput is subshining black above, gray on the sides and below. The thorax is densely brown pollinose on the dorsum, gray on the sides. The humeri are dark brown to black, slightly yellowed around margins. The halteres are yellow. Dorsocentral and marginal hairs are well developed, the former extend the full length of the notum. The scutellum has a row of six to eight strong bristles along the hind margin. Each propleuron has a fan of long pale bristles. The coxae are brown to black; the trochanters are yellowish, with fine short hairs beneath. The femora are chiefly dark brown to black with the bases and apices broadly yellow. Flexor spines and extensor hairs are well developed on the femora; the latter are especially strong and bristle-like on the apical portions of the middle femora. The tibiae are yellow and the tarsi are yellowish beneath, brownish above. The hind tibiae lack strong, erect bristles on the swollen portion. The wings are distinctly brownish fumose. The stigma is dark brown and fills all of the third costal section. The third section is slightly shorter than the fourth and the two sections combined are a little longer than the fifth. The r–m crossvein

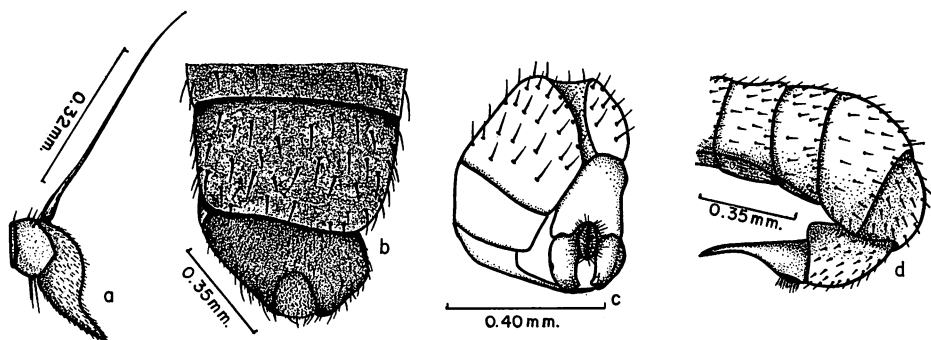


Figure 100—*Pipunculus juvator* Perkins: a, antenna; b, apex of male abdomen, dorsal (drawn from type); c, male genitalia, ventral; d, female abdomen, lateral.

is situated at the basal third of cell 1st M_2 and distinctly beyond a level with the apex of the subcostal vein. The last section of vein M_{1+2} is slightly curved, and the last section of M_{3+4} is equal in length to the m crossvein. The petiole of the cubital cell is slightly shorter than the m-cu crossvein. The sides of the abdomen are almost parallel, slightly widest at segment three. The terga are rather thickly covered with moderately strong, erect, bristles, especially on the posterior portions and on sides. The first tergum has a row of nine or ten strong bristles on each side. The first tergum is densely gray pollinose. Terga two and three are entirely brown pollinose, faintly subshining. The fourth tergum is brown pollinose along the basal one-third to one-half and is polished brown to black at its apex. The fifth tergum is entirely polished, metallic black, except for a very narrow brown, pollinose band across the base. The hypopygium is shining black in ground color, rather densely covered with microscopic brown pubescence; from a dorsal view it is just slightly shorter than the fifth segment and has a large apical depression (fig. 100b). From a ventral view the membranous area completely bisects the eighth segment. The ninth segment is dark brown to black, slightly longer than wide. The claspers are nearly equal in size and shape and are slightly bilobed at their apices (fig. 100c).

Length: body, 4.0–5.0 mm.; wings, 5.0–6.0 mm.

FEMALE. The third antennal segment is more distinctly yellow and slightly more acuminate than in the male. The front is gray to white below and polished black on the upper one-third to two-fifths. The occiput is more brownish gray on the upper portion than in the male. The mesonotum is distinctly gray on the sides and brownish gray above. The legs are as in male except that the extensor hairs are not so well developed and the bases of the femora are more broadly yellowed. The wings are more hyaline than in the males, the third costal section is also shorter, being about one-half as long as the fourth section. The abdomen is densely gray pollinose, slightly brownish on the dorsum. The black ground color is obscured by the dense pollen; in some specimens the dorsum is faintly shining. The ovipositor base is blackish and is tuberculate on the under

side. The piercer is reddish; it is straight or but slightly curved upward, is a little longer than its base, and extends to the apex of the second abdominal segment (fig. 100d). The piercer is distinctly separated from the base by a line across the apex of the basal portion.

Length: body, 4.0–4.5 mm.; wings, 5.0–5.5 mm.

Pipunculus juvator melanopodis (Hardy).

Dorilas juvator melanopodis Hardy, 1953, Proc. Haw. Ent. Soc. 15 (1):64.

Endemic. Maui (type locality: Makamakaole Valley), Molokai, and Lanai. The latter two are new island records.

Type in the United States National Museum.

Hosts. This species has been commonly taken flying in and above false stag-horn fern ("uluhe," *Dicranopteris linearis* (Burm.)). It apparently is associated with leafhoppers of the genus *Nesophrosyne*.

This is obviously a melanistic form of *juvator*, and is differentiated from the typical subspecies by the predominantly black tibiae, the blackened tarsi, and the more narrowly yellow femora. Also, the trochanters, the knobs of the halteres, and the claspers are brown to black.

Length: body, 3.5–4.0 mm.; wings, 4.0–5.0 mm.

Pipunculus (Pipunculus) juvencus, new species (fig. 101a–b).

This species is closely related to *P. juvator* Perkins and can be differentiated only by the characters of the male genitalia. I see no way to separate the females except that the third antennal segment of *juvencus* is pale yellow while that of *juvator* is typically yellow, tinged with brown; this character obviously would not be reliable. The male specimens can be readily differentiated by the square-shaped clasper (fig. 101b).

MALE. Fitting the description of *juvator* in most respects. The abdomen is usually entirely pollinose, thinly so over terga four and five, and often bare of pollen through the median portion of the fifth tergum. The entire abdomen is rather thickly covered with short, erect setae. From a dorsal view, the hypopygium looks like that of *juvator* (fig. 101a), with a large membranous area covering the entire apex. As seen from a ventral view, the ninth segment is wider than long, the V-shaped cleft on the posterior margin extends almost one-half the length of the segment. The claspers are quadrate in shape, approximately as wide as long (fig. 101b); when the genitalia are viewed from below the outer clasper often will be turned slightly so that the inside edge is seen rather than a direct ventral aspect, giving it the appearance of being much narrower than it actually is.

Length: body, 4.75–5.50 mm.; wings, 6.10–6.70 mm.

FEMALE. As noted above, I am unable to differentiate the female from those of *juvator*.

Body, 4.0–4.4 mm.; wings, 5.8–6.3 mm.

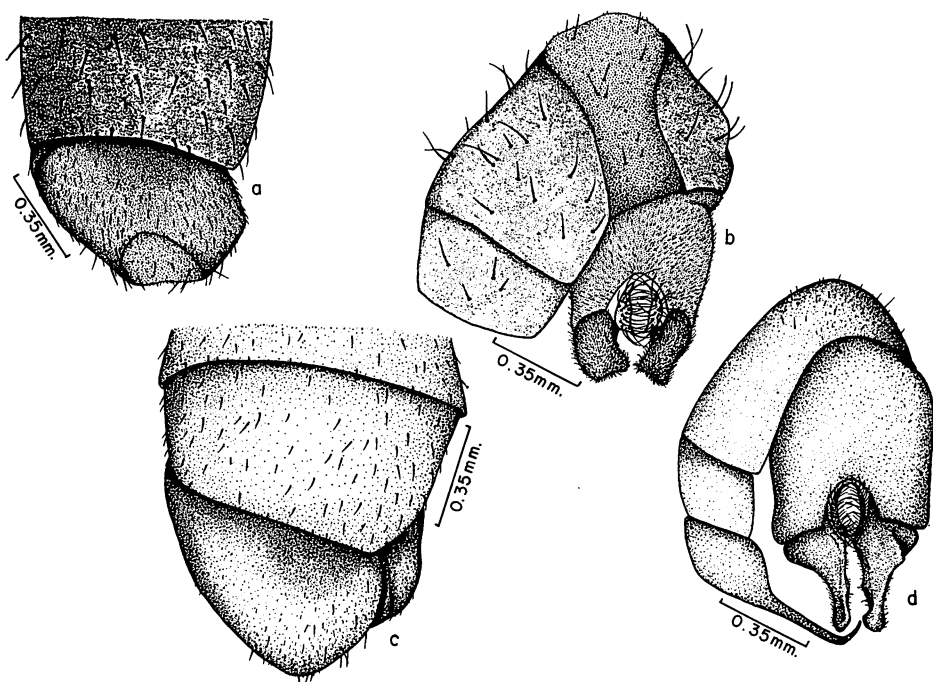


Figure 101—*Pipunculus juvenescus* n. sp.: a, apex of male abdomen, dorsal; b, male genitalia, ventral. *P. laterisutulis* n. sp.: c, apex of male abdomen, dorsal; d, male genitalia, ventral.

Holotype male and allotype female: Puu Kukui, Maui, *circa* 4,000 ft. elev., June, 1953 (D. E. Hardy). Thirty-six paratypes (18 males and 18 females): same locality as type, June, 1953, and July, 1956 (D. E. Hardy, C. R. Joyce, and R. Namba); and Paliku, Haleakala Crater, Maui, 6,400 ft. elev., June, 1952, and 1953 (D. E. Hardy and C. R. Joyce).

Two male specimens are on hand from the Upper Olaa Forest, Hawaii, collected on *Pipturus*, 4,000 ft., July, 1956 (D. E. Hardy), which are very close to *juvenescus*, apparently differing only by having the claspers rounded at the apices. This may be a distinct species, but more material needs to be studied.

Type, allotype, and a series of paratypes in the Bernice P. Bishop Museum. The remainder of the paratypes are in the following collections: United States National Museum, British Museum (Natural History), and the University of Hawaii.

***Pipunculus (Pipunculus) laterisutulis*, new species (fig. 101c-d).**

This species fits near *P. oahuensis* Perkins in the key because of the lack of a membranous area on the eighth segment of the male. The two species are apparently not closely related, however, and differ in many respects as pointed out in the key above. The differences in the male genitalia as shown in figures

101d and 106c will readily differentiate these. *P. laterisutilis* appears most closely related to *P. megameris* n. sp. because of the development of the ninth segment of the male. The lack of a membranous area on the eighth segment and the very differently developed claspers (fig. 101d) will differentiate this.

MALE. A moderately large, almost entirely black species. *Head:* The vertex and the upper anterior portion of the occiput are polished black. The posterior portion of the occiput is gray-brown pollinose and the lower portion is gray. The junction of the compound eyes is about equal in length to the lower portion of the front. The lower front is predominantly gray pubescent but has a shining black line extending down the median portion. The antennae are entirely dark brown to black; the third segment is moderately long acuminate, similar to that of *megameris*. *Thorax:* Predominantly polished black on the dorsum, lightly gray-brown pollinose on the sides and on the front portion of the mesonotum. The pleura are gray pollinose. The propleural fan is composed of about eight long gray hairs. The humeri are brown, tinged with yellow around their margins. The hairs of the dorsocentral rows are very short and inconspicuous. The hind margin of the scutellum has eight to ten short, inconspicuous hairs; the longest hair is approximately one-fifth as long as the scutellum. The halteres are yellow, tinged with brown on their knobs. *Legs:* Predominantly dark brown to black. The tibiae are entirely yellow and the femora are narrowly yellow at their bases and apices. Flexor spines and extensor hairs are moderately developed on all femora. Each hind tibia has one or two strong, erect setae on the outside of the swollen portion. *Wings:* Faintly infuscated; the stigma is brown and fills all of the third costal section. The third costal section is about two-thirds as long as the fourth and the two sections combined are about one-fourth longer than the fifth costal section. The r-m crossvein is situated near the basal two-fifths of cell 1st M_2 and the last section of vein M_{1+2} is moderately curved. The last section of vein M_{3+4} is about equal in length to the m crossvein and the last section of vein $Cu_1 + 1st A$ is about two-thirds as long as the ultimate section of M_{3+4} . *Abdomen:* Polished on the sides, opaque gray over the dorsal portion of the first tergum, gray-brown over the second and over the basal two-thirds of the third and the basal one-fourth of the fourth terga; otherwise, polished black, with rather conspicuous short, erect setae. As seen from a dorsal view, the eighth segment is rounded on the sides, tapered to a blunt point at apex, and no membranous area is developed. The dorsal portion of the eighth is subopaque brown pollinose. The left side of the segment is bare of pollen, polished black. The eighth segment has a longitudinal seam extending down the right side just based to the ninth segment. The sixth tergum is ventral to the fifth and the seventh is polished black, very closely joined to the eighth; it is rather difficult to see the suture separating these two segments. The ninth segment is greatly enlarged, very similar to that of *megameris*, and as seen from a left lateral view it extends almost to the apex of the eighth segment. The ninth segment is plainly visible from a dorsal view (fig. 101c). From a ventral view the ninth segment is wider than long, and has a deep V-shaped cleft in the middle of the hind margin.

The claspers are moderately long and slender, blunt at apices, and each with a moderately developed ventral keel extending longitudinally; this is more pronounced on the outer clasper (fig. 101d).

Length: body, 5.5 mm.; wings, 6.5 mm.

FEMALE. Unknown.

Holotype male: Kahiku, Maui, January, 1908 (F. W. Perry). Three male paratypes from the following localities on Maui: Same as type; Iao Valley, July, 1956 (D. E. Hardy); and Haleakala, 2,000 ft., no date or collector.

Type and one paratype in the Bernice P. Bishop Museum. The other paratypes in the United States National Museum and the University of Hawaii collections.

Pipunculus (Pipunculus) macrothrix, new species (fig. 102a-d).

This species fits in the *P. hawaiiensis* complex by having the legs entirely yellow and the hind tibiae with strong bristles on the swollen portion. It is readily differentiated by having the bristles of the hind tibiae unusually strong, about one-third as long as the tibia, and by having erect bristles in the median portions of the front and middle tibiae. Also, the front of the female is entirely pollinose and the r-m crossvein is situated near the middle of cell 1st M_2 (fig. 102c).

FEMALE. *Head*: The occiput is rather broad, about one-fourth as wide as the compound eyes, and entirely gray pollinose. The front is gray pollinose, distinctly expanded on the upper half. The area surrounding the ocellar triangle is shining black. The face is silvery gray pubescent, and is slightly wider than the lower portion of the front. The first two antennal segments are brown, the second is faintly tinged with yellow. The third segment is yellow, long acuminate ventrally (fig. 102a). *Thorax*: Subshining black, covered with gray pollen on the dorsum, entirely opaque gray on the sides. The humeri are brown to black, tinged with yellow around the hind margins. The halteres are yellow with a faint tinge of brown on the apices. The dorsocentral hairs are very fine, rather inconspicuous. About six moderate-sized black bristles are present on the hind margin of the scutellum; the longest bristles are about one-half the length of the scutellum. *Legs*: Almost entirely yellow except for the dark brown to black coxae; the femora each have a faint tinge of brown on the dorsomedian portion and the apical segments of the tarsi are tinged with brown. The femora are moderately thickened; the first two pairs have well-developed flexor spines on about the apical two-fifths of the segment. On the hind femora the flexor spines are represented by an anteroventral row of two-five black spines situated near the apical one-fourth of the segment; the posteroventral surface usually has no spines but sometimes has one or two small black spines. The extensor hairs are well developed on the posterodorsal surface of each femur; these are fine, yellow, and rather inconspicuous. The front tibia has two or three erect, black, posterior bristles situated at the middle of the segment. The middle tibia has about three anterior and three posterior bristles situated at the middle of the segment. The

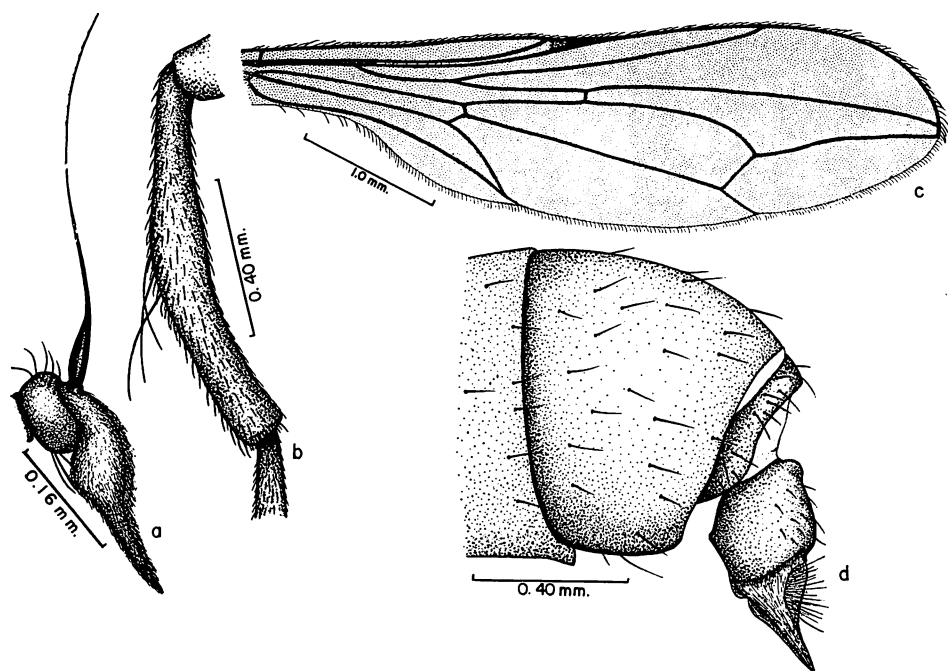


Figure 102—*Pipunculus macrothrix* n. sp.: a, antenna; b, hind tibia of female; c, wing; d, female ovipositor.

hind tibia has three very long black, posterior bristles as in figure 102b. *Wings*: Long and narrow, entirely hyaline except for the rather inconspicuous stigma in the third costal section. The wings are about three times longer than wide (fig. 102c). The third costal section is short, about one-third to one-fourth as long as the fourth section, and the stigma occupies about the apical two-thirds of the third section. The short third section and inconspicuous stigma would make this rather similar to *P. rotundipennis* Grimshaw, but that species is distinctly different in other details. The third and fourth costal sections combined are slightly longer than the fifth section. The r-m crossvein is situated at the basal two-fifths of cell 1st M_2 and the last section of vein M_{1+2} is gently curved. Cell R_5 is rather narrow, at its widest point the cell is about equal in width to the length of the m crossvein. The last section of vein M_{3+4} is slightly shorter than the m crossvein. The last section of vein $Cu_1 + 1st A$ is about equal in length to the r-m crossvein. *Abdomen*: Predominantly gray pollinose, polished black on the apico-dorsal four-fifths of the fifth tergum. The sixth tergum is completely hidden from dorsal view; it is reduced to just a narrow ring over the dorsum and is expanded on the lateral margins (fig. 102d). The ovipositor is short and inconspicuous, usually just the tip portion is visible. The base is subglobose; the piercer is about equal in length to the base (fig. 102d).

Length: body, 4.0 mm.; wings, 6.3–6.5 mm.

MALE. Unknown.

Holotype female: Bird Park, Kilauea, August, 1952, collected in association with *Nesophrosyne* sp. on *Pipturus hawaiiensis* (D. E. Hardy). Ten paratypes (all females): one same as type; one from Mountain View, Hawaii, March 31, 1906 (no collector given); and collected in association with *Nesophrosyne* sp. on *Pipturus hawaiiensis* (D. E. Hardy and W. C. Mitchell). It should be noted that the type and the one paratype from Bird Park were confused in the type series of *Pipunculus obscuratus* (Hardy) (1953:66).

Type and two paratypes in the Bernice P. Bishop Museum. The remainder of the paratypes are in the following collections: United States National Museum, British Museum (Natural History), the Hawaiian Sugar Planters' Association, and the University of Hawaii.

***Pipunculus (Pipunculus) megameris*, new species (fig. 103a-e).**

This species superficially resembles *P. sectus* n. sp. but differs by having strong erect setae on the swollen portion of the posterior tibia and by having the male claspers very differently developed (fig. 103d). It appears to be rather closely related to *P. delomeris* n. sp. but is differentiated by the all-black antennae and by the differences in the development of the posterior segments of the abdomen (fig. 103c) and the male genitalia (fig. 103d). This species is characterized by its predominantly black coloration, the very large ninth segment of the abdomen (fig. 103c), and by having the right side of the eighth segment polished.

MALE. *Head:* The junction of the compound eyes is about one-half longer than the lower portion of the front. The lower front is entirely gray pubescent. The face is about equal in width to the lower portion of the front. The antennae are entirely black; the third segment is moderately long acuminate (fig. 103a). The occiput is subshining black, faintly brown pollinose on the upper portion, gray below. *Thorax:* Subshining black, dusted with brown pollen on the dorsum, gray on the sides. The humeri are black; the halteres are yellow, tinged with brown on their apices and bases. A row of short, fine hairs extends down each dorsocentral line. The scutellum has about eight moderately long bristles on the hind margin, the longest bristle one-third to two-fifths as long as the scutellum. The disc of the scutellum is bare or nearly so. The propleural fan contains about a dozen long black hairs. *Legs:* Almost entirely black, tinged with yellow on the tibiae. Flexor spines and extensor hairs are moderately developed on the femora. Each hind tibia has a row of three to five erect setae on the outside of the swollen portion; the longest of these is about equal in length to the width of the tibia. Specimens which apparently fit this species except that the strong setae are not present on the hind tibiae have been seen from Maui and Molokai. This may be a variable character. *Wings:* Lightly infuscated. The stigma is brown and fills all of the third costal section. The third section of the costa is approximately equal in length to the fourth and the two sections combined are just slightly longer than the fifth costal section. The r-m crossvein is situated at the basal third of cell 1st M_2 and the last section of vein M_{1+2} is distinctly

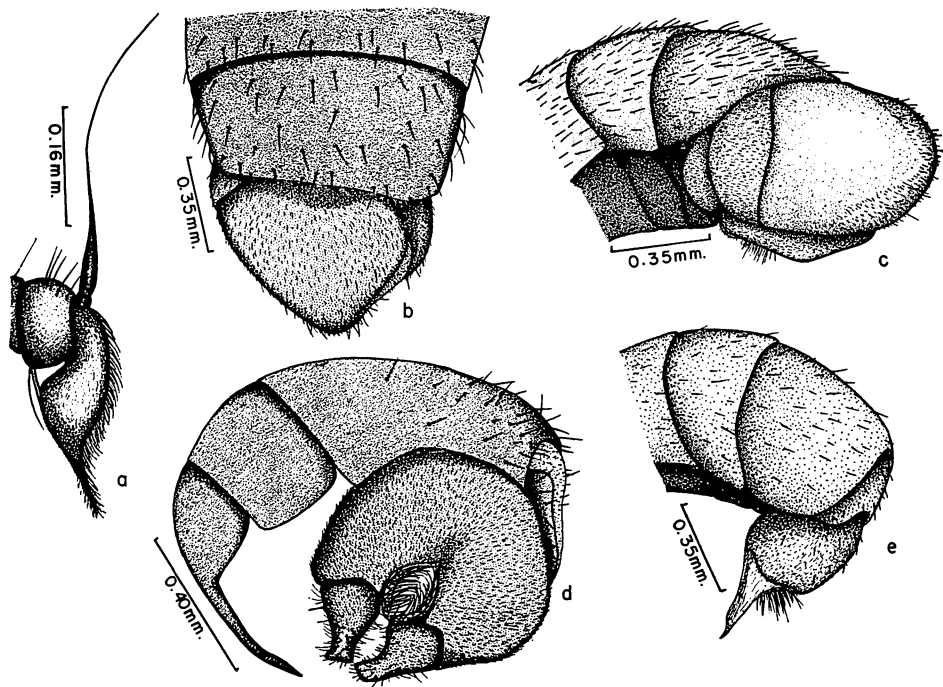


Figure 103—*Pipunculus megameris* n. sp.: a, antenna; b, apex of male abdomen, dorsal; c, abdomen of male, left side; d, male genitalia, ventral; e, ovipositor of female.

curved. The first tergum is gray and has about a dozen moderately long, black bristles on each side, these are arranged in two irregular rows. The second tergum is entirely opaque black, covered with brown pollen. The third tergum is predominantly opaque brown, polished on the posterolateral corners. The fourth and fifth terga are opaque brown along the anteromedian margins and are otherwise polished black. The hypopygium is slightly longer than the fifth abdominal segment, is rounded on the left side and has a moderately large membranous area on the right side (fig. 103b). The ninth segment is enlarged; as seen from the left side it extends almost to the apex of the eighth segment and is entirely black. The sixth abdominal segment is not visible from a dorsal view and is ventral to the fifth tergum as seen from a lateral view (fig. 103c). As seen from a ventral view the ninth segment is about as wide as long and has a rather deep V-shaped cleft on the posterior margin. The claspers are approximately three times longer than wide, gradually tapered, and truncate at apices (fig. 103d).

Length: body, 5.4 mm.; wings, 6.9 mm.

FEMALE. The upper two-thirds of the front is polished black, the lower third is gray. The front expands slightly in the median portion. The abdomen is entirely subshining, lightly gray-brown pollinose over terga two to six. The

base of the ovipositor is globose, black, tinged faintly with brown. The piercer is short and straight (fig. 103e).

Length: body, 4.6 mm.; wings, 6.1 mm.

Holotype male and allotype female: Waikamoi, Maui, 4,000 ft., collected flying over *Coprosma*, sp., August, 1958 (D. E. Hardy). Forty-three paratypes (37 males and 6 females) from the following localities: same as type, collected flying over *Coprosma* and over ferns, Kula Pipeline, Maui, June 11, 1927 (O. H. Swezey); Pepeopae, Molokai, 4,000 ft., July 30, 1959 (D. E. Hardy); above Wai-kolu Valley, 1,400 m., Molokai, May 2, 1955 (C. R. Joyce); Puu Kolekole, Molokai, July, 1952 (D. E. Hardy); Maunawainui Valley, Molokai, July, 1952, collected flying in the foliage of tree fern (*Cibotium* sp.), (M. Tamashiro and D. E. Hardy); and Kahuaawi Gulch, Molokai, July, 1952, flying in the foliage of tree ferns (*Cibotium* sp.), July, 1952 (M. Tamashiro and D. E. Hardy); and ridge above Haelaau, Maui, 3,000–3,300 ft., December 21, 1928 (E. H. Bryan, Jr.).

Type, allotype, and a series of paratypes in the Bernice P. Bishop Museum. The remainder of the paratypes deposited in the following collections: United States National Museum, British Museum (Natural History), the Hawaiian Sugar Planters' Association, and the University of Hawaii.

***Pipunculus (Pipunculus) molokaiensis* Grimshaw (fig. 104a–b).**

Pipunculus molokaiensis Grimshaw, 1913, Fauna Hawaiiensis 3:17.

Endemic. Molokai (type locality: "Molokai Mountains, 3,000 ft."), Maui, Lanai, and Hawaii. The latter three are new island records.

Type in the British Museum (Natural History). I have studied the type and have designated homeotypes from the mountains of Molokai.

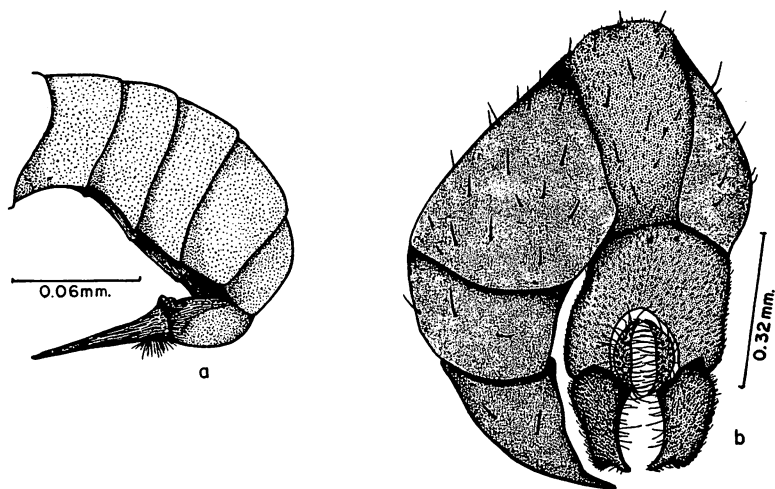


Figure 104—*Pipunculus molokaiensis* Grimshaw: a, abdomen of female, lateral; b, male genitalia, ventral.

This species shows very close relationship to *P. juvator* Perkins and may possibly be a subspecies. It differs from *juvator* by having the abdomen almost entirely polished black and the marginal setae on the scutellum rather small and inconspicuous. In most other details, including the genitalia, the two species appear almost identical. The third antennal segment of *molokaiensis* is yellow while in typical *juvator* the third segment is brown to black. Also, the female ovipositor has a pair of small tubercles at the base in *molokaiensis*; these are not developed in typical *juvator*. This species will also fit the description of *P. titanus* in most respects. The specimens are considerably smaller, however, and the male genitalia are quite different as seen in figure 104b. The female ovipositor is as in figure 104a.

Length: body, 5.0–6.0 mm.; wings, 6.5–7.5 mm.

Pipunculus (Pipunculus) nigrotarsatus Grimshaw (fig. 105a–f).

Pipunculus nigrotarsatus Grimshaw, 1901, Fauna Hawaiiensis 3 (1):18.

Pipunculus vulcanus Perkins, 1910, Fauna Hawaiiensis 2 (6):697. New synonymy.

Endemic. Hawaii (type locality: of *nigrotarsatus*, Kona, 4,000 ft. of *vulcanus*, Kilauea) and Maui. The specimens seen from Maui (Olowalu, 1,200–1,300 ft., March, 1908, (W. M. Giffard); and Haleakala, no date or collector) compared in all respects with the type of *vulcanus*, based upon external characters. The claspers of the male show slight differences in shape (slightly enlarged at the apices in specimens from Maui) but I have not found sufficient differences to warrant treating these as two species. I have a series of homeotypes of *nigrotarsatus* from Kukaiaua, Hawaii, August, 1952 (D. E. Hardy and W. C. Mitchell).

Type of *nigrotarsatus* in the British Museum (Natural History). Type of *vulcanus* in the Bernice P. Bishop Museum.

This species shows close relationship to *P. rotundipennis* Grimshaw and the two may possibly prove to be synonymous. It will be necessary to compare a large series of specimens to determine the importance of the characters now being used to separate these. The specimens of *nigrotarsatus* have a distinct point, almost a spur, developed at the ventral apex of each hind tibia (fig. 105e). This is sometimes difficult to discern and is best studied in reflected light. Some variation has been seen in this character and I cannot be sure that it is wholly reliable. *P. nigrotarsatus* is also differentiated from *rotundipennis* by lacking a visible sub-apical membranous area on the male hypopygium (as seen in dorsal view) and having a small longitudinal seam on the right side. The details of the male claspers and the internal details of the genitalia have not been studied for specimens positively known to be *rotundipennis*, so these characters cannot be compared at this time.

MALE. Following is a redescription of the type male. The lower portion of the front is brownish gray to gray-black pubescent, the face is gray with a faint tinge of yellow. The antennae are entirely black. The third segment is acute below (fig. 105a). The mesonotum is predominantly brown pollinose, the sides,

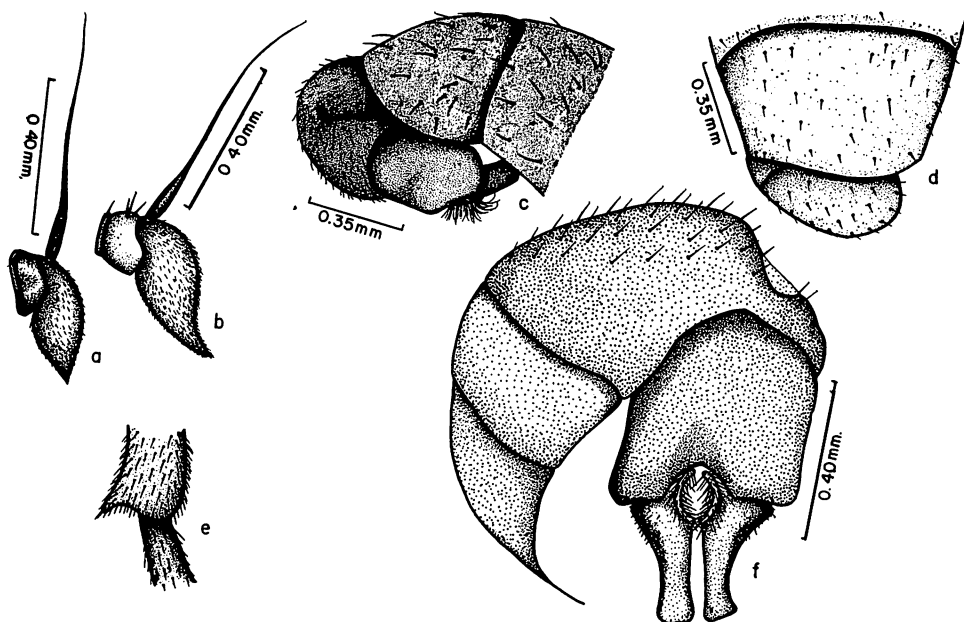


Figure 105—*Pipunculus nigrotarsatus* Grimshaw: a, antenna of type male; b, antenna of female; c, apex of male abdomen, right side; d, apex of male abdomen, dorsal; e, apex of hind tibia of type male; f, male genitalia, ventral.

however, are bare of pollen, polished black. In this regard it resembles *P. amplus* n. sp., but the genitalia of the two are strikingly different (figs. 86c and 105f). The scutellum has eight to ten black setae on the margin; the longest of these is about one-third to one-fourth the length of the scutellum. The disc of the scutellum is very sparsely covered with short, inconspicuous setae. The legs are predominantly black, the tibiae are yellow, often discolored with brown; the tarsi are conspicuously blackened. The hind tibiae lack strong, erect setae on the swollen portion. Each hind tibia terminates in a sharp ventral point at apex (fig. 105e); this is almost spur-like in some specimens. The wings are faintly infuscated. The stigma is brown and fills all of the third costal section. The third section is about two-thirds as long as the fourth, and the third and fourth combined are slightly longer than the fifth costal section. The r-m crossvein is situated near the basal two-fifths of cell 1st M_2 and the last section of vein M_{1+2} is slightly curved. The first two abdominal terga are entirely pollinose; the first is gray, the second is brown. The third segment is predominantly brown pollinose, polished black on the sides. The fourth segment is broadly brown pollinose on the basal portion, the apical two-thirds is polished black. The fifth tergum is entirely polished black except for a thin brown pollinose line along the basal margin. The abdomen is rather sparsely covered with short setae. As seen from a dorsal view, the hypopygium is rather evenly rounded, no membranous area

is present, and it is about two-thirds as long as the fifth abdominal segment (fig. 105d). A distinct seam is present on the right side of the eighth segment (fig. 105c). From a ventral view the ninth segment is about as wide as long and has a small U-shaped cleft on the posterior margin. The claspers are rather slender, three to four times longer than wide, and rather concave at apices (fig. 105f).

Length: body, 5.0 mm.; wings, 6.0 mm.

FEMALE. The female of *nigrotarsatus* (based upon the allotype of *vulcanus* and other compared specimens) has the upper three-fifths of the front polished black. The third antennal segment is short to moderately acuminate (fig. 105b). The ovipositor is very short and completely hidden by the overlapping sides of the terga. The fifth tergum is entirely polished. The remainder of the abdomen is gray-brown pollinose.

Length: body, 3.7 mm.; wings, 4.2 mm.

Pipunculus (Pipunculus) oahuensis Perkins (fig. 106a-d).

Pipunculus oahuensis Perkins, 1905, Rept. Expt. Sta. Haw. Sugar Planters' Assn. Bull. 1 (4):153.

Endemic. Oahu (type locality: "Mountains of Oahu, 1,000 ft.") .

Type in the Bernice P. Bishop Museum.

The females of this species fit fairly close to *P. megameris* n. sp. but are differentiated by the very inconspicuous ovipositor and by the conspicuously yellow coloration of the legs. The males are readily differentiated by the distinctive genitalia as shown in figures 103d and 106c.

The following is a redescription of the type.

MALE. The eyes are joined for a distance equal to over half the length of the frontal triangle; the latter and the face are gray pubescent. The face is not at all narrowed and is equal in width or slightly wider than the lower portion of the front. The first two antennal segments are brown to black, the third is yellow, faintly tinged with brown in the ground color. The third segment is moderately acuminate (fig. 106a). The thorax is subshining black, lightly brownish pollinose. Dorsocentral hairs are present but are very short and inconspicuous. The scutellum has six to eight short marginal bristles; the longest bristles are one-third to one-fourth as long as the scutellum. The pleura and metanotum are gray. The humeri are black and the halteres are yellow. The wings are rather long and slender and distinctly brownish fumose. The stigma is brown and fills all of the third section of the costa. The third section is about half as long as the fourth and the two combined are about equal in length to the fifth. The r-m crossvein is situated at the basal third of cell 1st M_2 and the last section of M_{1+2} is gently curved. The coxae and tarsi are brown to black. The tibiae are all yellow; the trochanters are chiefly yellow with a brownish tinge in the coloration on the hind two pairs. The femora have broad black median bands and yellow apices and bases. Flexor spines are well developed and extensor hairs are especially strong on the middle femora where they are bristle-like on the

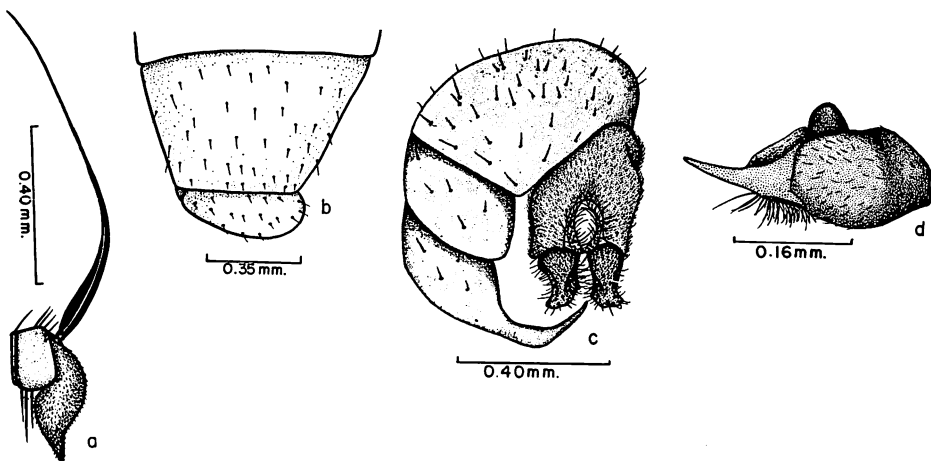


Figure 106—*Pipunculus oahuensis* Perkins: a, antenna (drawn from type); b, apex of male abdomen, dorsal (from type); c, male genitalia, ventral; d, female ovipositor, lateral.

posterior half of the segment. The hind trochanters have fine pale pile beneath. Each hind tibia has four or five strong, erect bristles on the outside of the swollen portion. The first tergum of the abdomen is gray, the second is opaque brownish gray. The third tergum is chiefly opaque brown, shining black along the posterior margin. The fourth tergum is polished black except for a very narrow opaque brown band across the base. The fifth tergum is entirely polished. The sides of the abdomen are straight or nearly so. The abdomen is sparsely pilose, with scattered, inconspicuous short setae; these are more numerous on the fifth segment. The hypopygium is opaque brownish, short, and poorly developed as seen in dorsal view. The eighth segment is rounded, compressed to the right, and with no membranous area; as seen from above, the eighth segment is about one-third as long as the fifth (fig. 106b). (The description and figures of the ventral aspects are based upon a homeotypic specimen.) The ninth segment is dark brown, the claspers reddish brown. The later are approximately equal in size and are roughly boot-shaped (fig. 106c).

Length: body, 4.0–4.5 mm.; wings, 5.0–5.7 mm.

FEMALE. The upper half of the front and the ocellar triangle are polished black, the lower portion and the face cinereous. The third tergum is entirely pollinose and the fourth is largely so, with just the hind margin shining black. The fifth tergum is polished black. The sixth segment is rather poorly developed and is about half as long as the fifth. The ovipositor is short and does not extend as far as the base of the fifth segment. The piercer is yellow and the base of the ovipositor is black; the ovipositor has a small ventral tubercle on the base (fig. 106d). The ovipositor and the sixth abdominal segment are usually completely hidden beneath the fifth tergum.

Length: body, 3.5–4.0 mm.; wings, 4.5–5.0 mm.

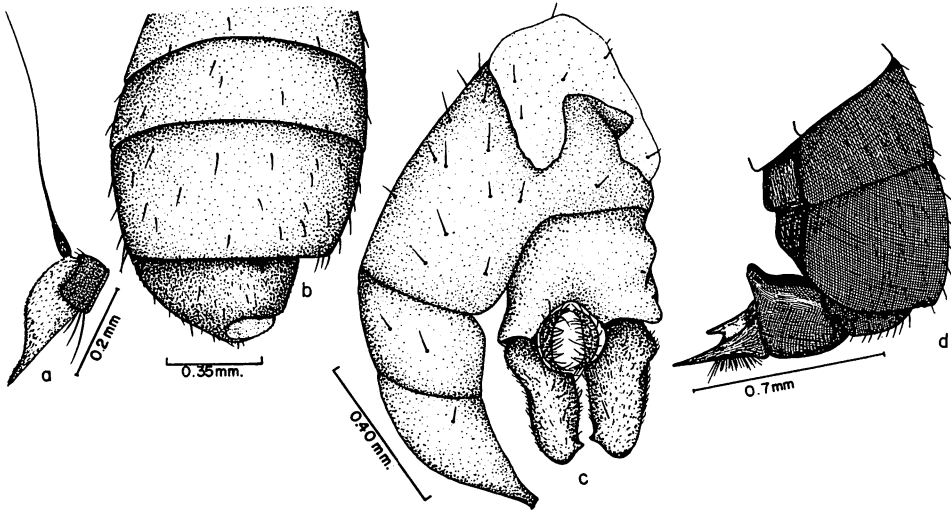


Figure 107—*Pipunculus obscuratus* (Hardy): a, antenna; b, male abdomen, dorsal; c, male genitalia, ventral; d, female abdomen, lateral.

***Pipunculus (Pipunculus) obscuratus* (Hardy) (fig. 107a–d).**

Dorilas (Dorilas) obscuratus Hardy, 1953, Proc. Haw. Ent. Soc. 15 (1):66, fig. 4a–d.

Endemic. Hawaii (type locality: Keanakolu, 5,200 ft.).

Type in the United States National Museum.

Hosts. Unknown. Specimens have been taken flying over tree fern (*Cibotium chamissoi* Kaulf.) in association with *Nesosydne ipomoeicola* Kirkaldy and with a *Nesophrosyne* sp. Other specimens have been taken flying in the foliage of *Pipturus hawaiiensis* and *Clermontia* sp.

This species is related to *P. cornutus* (Hardy) but is differentiated by the genital characters of both sexes as shown in figures 91c–d and 107 c–d. Also, by the very short third costal section of the wing, by the predominantly cinereous front of the female, and by the more extensively pollinose abdomen of the male.

MALE. Fitting the description of *cornutus* in most respects. The antennae are as in figure 107a. The femora of the males are slightly thickened and each has a brown to black median discoloration on the dorsal surface. The third costal section is about one-fourth as long as the fourth section, and the two combined are about one-fourth longer than the fifth costal section. The abdomen of the male is predominantly gray-brown pollinose. The fifth tergum is polished black on the apical third to one-fourth. The male hypopygium has a large membranous area on the right side of the apex (fig. 107b). The seventh tergum is plainly visible from a dorsal view. From a ventral view, the membranous area covers the entire right side of the apex of the genitalia and almost completely bisects the eighth segment. The concavity on the posterior margin of the ninth segment is very shallow and the cerci extend well beyond the apical margins of the ninth.

The claspers are about three times longer than wide and are blunt at apices; each has a slight point on the inner edge (fig. 107c).

Length: body, 4.5 mm.; wings, 7.0 mm.

FEMALE. The front is slightly expanded on the upper half and is entirely gray pubescent except for the extreme upper portion just below the ocelli. The thorax is more distinctly gray pollinose on the dorsum than in the male and the abdomen is entirely pollinose. The sixth segment is poorly developed and is scarcely visible from a dorsal or a lateral view. The base of the ovipositor is black; the piercer is yellow, the basal portion has a pair of strong tubercles beneath. The piercer is approximately equal in length to the base, and the oviduct is situated on a strong ventral prominence (fig. 107d). The piercer extends to about the apex of the third abdominal segment.

Length: body, 3.5–4.0 mm.; wings, 6.0 mm.

Pipunculus (Pipunculus) obstipus, new species (fig. 108a–b).

This species fits near *P. trichostylis* n. sp. but differs by having the fourth and fifth abdominal terga of the male predominantly polished black and by having the claspers attenuated at the apices (fig. 108b).

Fitting the description of *trichostylis* in most respects.

MALE. *Head:* The upper portion of the occiput is subshining black, thinly gray-brown pollinose. The junction of the compound eyes is about one-half longer than the lower portion of the front. The first two antennal segments are brown, the third segment is yellow, long acuminate below. *Thorax:* Shining black in ground color, gray on the sides, and lightly gray-brown pollinose on the dorsum. The scutellum has about ten moderately long, black, marginal bristles; the longest of these is about equal to one-half the length of the scutellum. *Legs:* The femora are black, broadly yellow at their bases and apices. The tibiae are yellow. The tarsi are brown on the dorsal surfaces. Each hind tibia has one strong anterior bristle on the swollen portion. *Wings:* The apical three-fourths is evenly infuscated, the basal portion is subhyaline. The stigma is brown and fills all of the third costal section. The third section is one-half to two-thirds as long as the fourth and the two sections combined are one-third to one-fourth longer than the fifth section. The r–m crossvein is situated slightly beyond the basal third of cell 1st M_2 and the last section of vein M_{1+2} is moderately curved. The last section of vein M_{3+4} is about equal in length to the m crossvein and $Cu_1 + 1st A$ is almost equal in length to the m–cu crossvein. *Abdomen:* The first tergum is gray and has eight to ten black bristles on each side. Terga two and three are lightly gray-brown pollinose on the dorsum, gray on the sides. The fourth tergum is predominantly polished black with a thin pollinose band across the base and gray on the sides. The fifth tergum is entirely polished black except for a very narrow line of gray-brown pollen along the base of the segment. The abdomen is rather sparsely covered with short, inconspicuous setae. The hypopygium is entirely opaque gray-brown pollinose, almost as long as the fifth ab-

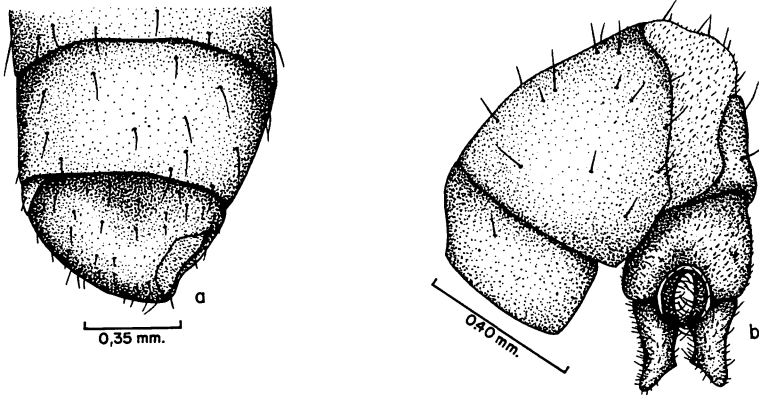


Figure 108—*Pipunculus obstipus* n. sp.: a, apex of male abdomen, dorsal; b, male genitalia, ventral.

dominal segment, compressed to the right, and with a conspicuous membranous area on the right side (fig. 108a). As seen from a ventral view, the membranous area completely bisects the eighth segment. The ninth segment is slightly wider than long and has a small U-shaped concavity in the middle of the hind margin. The claspers are three or more times longer than wide and are attenuated at apices as shown in figure 108b.

Length: body, 4.50–4.75 mm.; wings, 7.00 mm.

FEMALE. Unknown.

Holotype male: Puu Kukui, Maui, circa 4,000 ft., June, 1953 (D. E. Hardy). Two male paratypes: same data as type (D. E. Hardy and C. R. Joyce).

Type in the Bernice P. Bishop Museum. One paratype each in the collections of the United States National Museum and the University of Hawaii.

***Pipunculus (Pipunculus) perkinsiellae* (Hardy) (fig. 109a–d).**

Dorilas (Dorilas) perkinsiellae Hardy, 1953, Proc. Haw. Ent. Soc. 15 (1) :69, fig. 5a–d.

Endemic. Oahu (type locality: "Oahu Plantation, field no. 40"). Known only from Oahu.

Type in the Hawaiian Sugar Planters' Association collection.

Host. *Perkinsiella saccharicida* Kirkaldy. It was reared from sugar-cane leafhopper from several areas on Oahu by F. X. Williams, O. H. Swezey, and J. C. Bridwell in 1918 and 1919 but has not been associated with this leafhopper since the latter date. The most recent collections have been from Mt. Kaala, April, 1953; Konahuanui Trail, August, 1953; and Mt. Kaala, June, 1956 (all on Oahu). But these specimens were not associated with the leafhopper host. This is obviously the species referred to by Timberlake (1919:38–39) as a species near *P. terryi* Perkins.

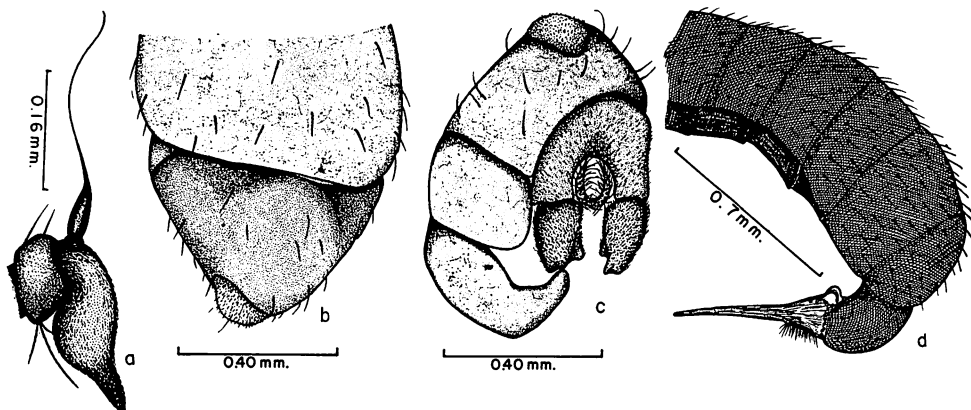


Figure 109—*Pipunculus perkinsiellae* (Hardy): a, antenna; b, apex of male abdomen, dorsal; c, male genitalia, ventral; d, abdomen of female, lateral.

This species is very similar to *P. swezeyi* Perkins and *alienus* (Hardy) but is differentiated by the short third costal section of the wing and by the male genital characters as shown in figures 85c, 109c, and 113c. From a dorsal view the hypopygium looks much like that of *P. filicicolus* n. sp.; the ventral aspects, however, are quite different; also, the abdomen is entirely opaque black rather than being polished black.

MALE. The third antennal segment is clear yellow and short acuminate (fig. 109a). The thorax is shining black in ground color, dusted with gray-brown pollen on the dorsum, gray on the sides. Humeri yellow-brown. Halteres yellow, tinged with brown on the apices and bases. The scutellum has about six, moderately long, black setae on the hind margin. The legs are predominantly yellow, faintly tinged with brown over the dorsal surfaces of the femora, and the coxae are pale brown covered with gray pollen. Moderately developed flexor spines are present on the apical one-third to two-fifths of the front and hind femora and on the apical two-thirds of the middle femora. The wings are subhyaline, faintly infuscated. The third costal section is approximately one-half as long as the fourth and the two sections combined are about equal in length to the fifth section. The stigma is pale brown and fills all of the third costal section. The r-m crossvein is situated near the basal two-fifths of cell 1st M_2 and the last section of vein M_{1+2} is gently curved. The abdomen is subshining brown to black in ground color, brown pollinose over the dorsum of terga two to five, and gray on the sides and over the first tergum. The hypopygium has a moderately large apical membranous area and as seen from a dorsal view is about two-thirds as long as the fifth abdominal segment. From a ventral view the sixth segment is equal in length to the seventh and the inner margin is strongly curved posteriorly. The membranous area is confined to the apex of the eighth segment (fig. 109b). The ninth segment is about as wide as long and has a rather shallow concavity

on the posterior margin. The claspers are rather broad, blunt at apices, and each has a small subapical point on the inner margin (fig. 109c).

Length: body, 4.0 mm.; wings, 5.5 mm.

FEMALE. A female specimen from Kuliouou, Oahu, apparently belongs here; it fits the description of the male in most regards. The upper one-fourth of the front is polished black; the lower portion and the face are silvery white pubescent. The front is expanded slightly in the median portion, the lower part of the front is about equal in width to the upper part of the face. The thorax and abdomen are more opaque brownish gray pollinose than in the male. The sides of the abdomen are parallel. The sixth segment is well developed, approximately equal in size to the fifth, and its hind margin is nearly straight. The base of the ovipositor is dark reddish brown and the piercer is yellow to rufous. The piercer is long and slender (fig. 109d); it extends nearly to the base of the abdomen, is two times longer than its base, and has a pair of tubercles developed on the lower posterior portion.

Length: body, 3.5 mm.; wings, 4.5 mm.

Pipunculus (Pipunculus) proditus, new species (fig. 110a–e).

This species is related to *P. chauliosternum* n. sp. and can be readily separated by the characters given in the key. It rather closely resembles *P. terryi* Perkins because of the yellow-brown to brown banding of the femora, but it is easily separated from *terryi* by the presence of the strong bristles on the outside surface of each hind tibia as well as by genital and other characters.

MALE. *Head:* The junction of the compound eyes is nearly two times longer than the frontal triangle. The frontal triangle and the face are densely silvery gray pubescent. The lower half of the occiput is gray, the upper portion is subshining, lightly dusted with brown. The antennae are predominantly yellow, the basal two segments lightly tinged with brown. The third antennal segment is long acuminate, the attenuated portion approximately equal in length to the remainder of the segment (fig. 110a). *Thorax:* Subshining brown in ground color, lightly dusted with brown on the dorsum, grayish on the sides. The humeri are brown, their extreme hind margins yellowish. The halteres are entirely yellow. The bristles on the hind margin of the scutellum are moderately developed; the disk of the scutellum is bare. The dorsocentral hairs are very poorly developed. *Legs:* The coxae are brown; the trochanters, tibiae, and the basal subsegments of the tarsi are yellow; the femora are predominantly yellow with brownish rings around the middle portions. Flexor spines are developed on all femora and each hind tibia has strong erect bristles on the outside surface. *Wings:* Very faintly fumose, almost hyaline. The stigma is brown and fills all of the third costal section. The third section is approximately equal in length to the fourth and the two sections combined are about equal in length to the fifth. The r-m crossvein is situated at the basal third of cell 1st M_2 and the last section of vein M_{1+2} is slightly curved. *Abdomen:* Chiefly polished, gray only on the first ter-

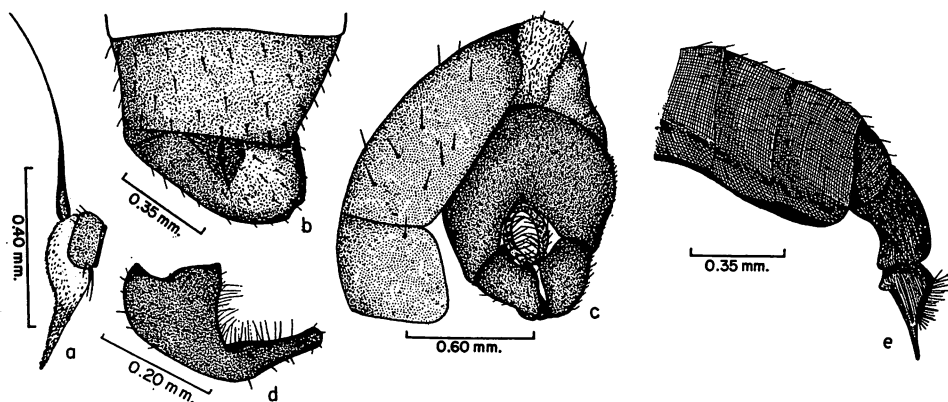


Figure 110—*Pipunculus proditus* n. sp.: a, antenna; b, apex of male abdomen, dorsal; c, male genitalia, ventral (from type); d, clasper of male, lateral; e, abdomen of female, lateral (from allotype).

gum; terga two to four are polished on the apical portions and faintly brownish pollinose on their bases; the fifth tergum is entirely polished, except for a faint subopaque area around the basal margin. The first tergum has a row of four or more strong bristles on each side. The abdomen is otherwise rather sparsely haired. The hypopygium is brownish pollinose, lightly shining; it is almost as long as the fifth segment and has a membranous area at the right side of the apex; this membranous portion is largely ventral in position and is not clearly visible in a direct dorsal view (fig. 110b). From a lateral or a ventral view the membranous area completely bisects the eighth segment and extends to the basal portion of the ninth (fig. 110c). The ninth segment and the claspers are rufous in color. The claspers are slender and curve strongly upward (fig. 110d); the apices are hidden under the abdomen in undissected specimens. The outer clasper has a subapical point developed on the inner margin (fig. 110c).

Length: body, 3.8–4.0 mm.; wings, 5.0–5.3 mm.

FEMALE. *Head:* Only the upper one-fourth of the front is polished black; the remainder is cinereous. The front is slightly expanded just above the median portion. The occiput is almost entirely gray; it is slightly brownish only at the extreme upper portion. *Thorax:* Chiefly gray pollinose, very faintly dusted with brown on the dorsum. *Legs:* As in the male, with yellow-brown to dark brown discoloration around the median portions of the femora. *Wings:* Hyaline or nearly so. The third costal section is slightly shorter than the fourth. *Abdomen:* Almost entirely gray pollinose, dusted with brown only in the median portions of terga two to five. The sixth segment is moderately well developed; it is approximately three-fourths as long as the fifth segment as seen in a dorsal view. The base of the ovipositor is black and the piercer is rufous; the latter is very short, approximately equal in length to the base, and has a small tubercle below (fig. 110e). The piercer extends to about the basal portion of the fifth abdominal segment.

Length: body, 3.2–3.8 mm.; wings 4.5–5.3 mm.

Holotype male: Lanihuli, Oahu, October 19, 1919 (F. X. Williams). Allotype female: Kuliouou, Oahu, June 25, 1916. Five paratypes (four males, one female) from the following: same data as allotype; Opaecula, Oahu, January, 1953 (C. P. Hoyt); Kaumuohona, Oahu, July, 1916, on *Dubautia* and June 1919 (F. X. Williams); and Mt. Tantalus, Oahu, August 1955, flying over ferns (D. E. Hardy).

One female specimen is at hand from Manoa Ridge, Oahu, June 18, 1916, which apparently belongs here. The sixth segment, however, is scarcely one-third as long as the fifth and the ovipositor is slightly larger than in typical *proditus*. Two female specimens are also at hand from Kokee, Kauai, June 11, 1919 (H. T. Osborn). These differ from typical *proditus* by having the disk of the scutellum rather thickly haired, and by having the upper one-half of the front shining black. These three specimens are not being designated as paratypes.

The type and allotype are in the Hawaiian Sugar Planters' Association collection; the paratypes are being deposited in the Bernice P. Bishop Museum, United States National Museum, and the University of Hawaii.

Pipunculus (Pipunculus) rotundipennis Grimshaw (fig. 111a–c).

Pipunculus rotundipennis Grimshaw, 1901, Fauna Hawaiiensis 3 (1):18, pl. 2, fig. 6.

Pipunculus pyrophilus Perkins, 1910, Fauna Hawaiiensis 2 (6):698.

New synonymy.

Endemic. Hawaii (type locality: Kilauea). Previously known only from the type female collected in 1896. The type and allotype of *pyrophilus* were also from Kilauea. They are in the B. P. Bishop Museum. A series of specimens on hand from Oahu, Lanai, Molokai, Maui, and Kauai are probably *rotundipennis*. I am identifying them with a query, however, until more specimens can be studied from the type locality.

Type in the British Museum (Natural History). I have studied the type.

Host. Not definitely known. Perkins indicated on the specimens of *pyrophilus* that they were "attached to one or both of the small delphacid leafhoppers that are so common on *Raillardia* around the crater." These were probably *Nesosydne chambersi* Kirkaldy and *N. raillardiae* Kirkaldy.

This species was erroneously placed in the genus *Tomosvaryella* by Aczél (1948:29), and from the original description and figure it would certainly appear to be a *Tomosvaryella*. Grimshaw failed to indicate a stigma in the wing; subsequent examination of the type has proved that the stigma is present although it is short and inconspicuous.

FEMALE. Following is a redescription of the type female. A rather small, almost entirely shining black species. The front is distinctly wider than the face and entirely subshining black except for the lower one-fifth to one-fourth which is gray pollinose. The face is densely gray pubescent. The occiput is polished

black, grayish only on the lower portion. The antennae are dark brown to black, the third segment short acuminate (fig. 111a). The thorax is subshining to shining black on the dorsum, subopaque grayish on the pleura, with a row of moderately long hairs down each dorsocentral line, extending the entire length of the mesonotum, and also with moderately long hairs along the lateral margins. The disc and margin of the scutellum are rather thickly setose. The humeri and halteres are black. The legs are predominantly dark brown to black, tinged with yellow on the three basal segments of the tarsi and the bases of the tibiae. No erect bristles are present on the smaller portion of the hind tibia. The wings are as in figure 111c, rather broad, and rounded apically. The third costal section is short, about one-third as long as the fourth, with a distinct but short stigma. The fifth costal section is distinctly longer than the combined lengths of the third and fourth. The r-m crossvein is situated at the basal third of cell 1st M_2 and the last section of vein M_{1+3} is slightly curved. The abdomen is entirely shining black, with a dense clump of hairs on each side of the first tergum. These are arranged in two or more rows. The fifth tergum is one and one-third to one-fourth longer than the fourth. The sixth tergum is not visible *in situ*. The lateral margins of the fifth tergum extend almost to the mid-line on the venter and cover over the base of the ovipositor. The ovipositor is very short. The piercer is yellow and appears to be slightly shorter than its base; it is scarcely visible in the type. The ovipositor is concealed by the overlapping abdominal terga. From end view just a thin line of the sixth tergum is visible; it is obviously very short and not at all well developed.

Length: body, 3.0 mm.; wings, 3.7 mm.

MALE. Following is a redescription of the type male of *pyrophilus*. The head is broken off. The thorax is entirely subshining black, lightly brownish dusted on the dorsum, grayish on the sides. The hairs of the mesonotum are unusually strong, the dorsocentral and marginal hairs are about as strong as the scutellars. The scutellum has about a dozen strong hairs scattered over the disc and about a dozen hairs around the hind margin. The longest is near one-half the length of the scutellum. The humeri are black and each has a clump of moderately long black hairs on its hind margin. The halteres are brownish, tinged with yellow. Just two legs are present on the type—one front leg and one middle leg. These are all black or dark brownish black. Flexor spines are present on the femora and extensor hairs are especially strong on the middle legs. The wings are lightly but distinctly fumose. The stigma fills all of the third costal section. The third section is about one-third as long as the fourth. The two combined are slightly longer than the fifth. The r-m crossvein is situated at the basal one-third of cell 1st M_2 and the last section of vein M_{1+2} is just slightly curved. The apical cell (cell R_5) is rather strongly narrowed (the right wing of the type is aberrant, the apical cell is closed at the costa). The last section of vein M_{3+4} is shorter than the m crossvein. The sides of the abdomen are almost straight; it is slightly widest at segments three and four and is covered with scattered erect hairs. These are rather well developed especially on the fifth tergum. The abdo-

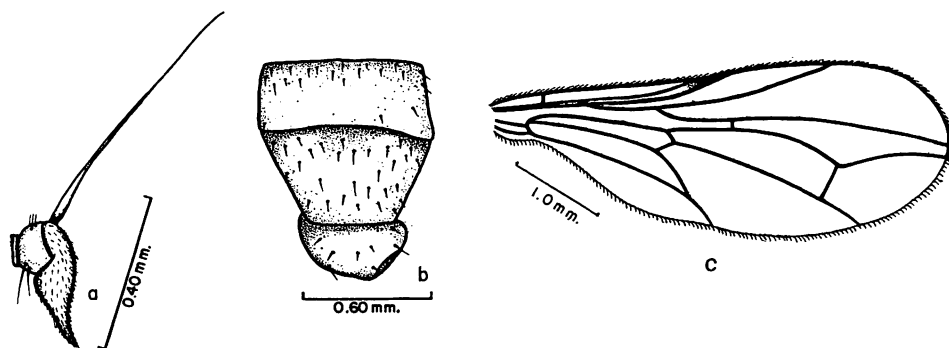


Figure 111—*Pipunculus rotundipennis* Grimshaw: a, antenna; b, apex of male abdomen, dorsal; c, wing of type female.

men is shining black, lightly brownish pollinose on the dorsum, grayish brown on the sides, and over the first tergum. The fifth tergum is largely polished black, lightly dusted on the anterior portion. The hypopygium is rather bluntly pointed as seen from a dorsal view, about three-fourths as long as the fifth abdominal segment, and with a small subapical membranous area on the right side (fig. 111b). The ninth segment is shining black. The claspers are not plainly visible on the type.

Length: body and wings, 3.0–3.5 mm.

***Pipunculus (Pipunculus) sectus*, new species (fig. 112a–d).**

This species rather closely resembles *P. megameris* n. sp. The two are similar in many respects and the similarity in the development of the ninth segment of the male would indicate close relationship. *P. sectus* is differentiated by lacking strong erect setae on the hind tibiae and by the differences in the shape of the male claspers (fig. 112c).

MALE. Head: The junction of the compound eyes is slightly shorter than the frontal triangle. The frontal triangle and the face are densely silvery gray pubescent. The upper portion of the front, just before the ocelli, is shining black. The upper two-fifths of the occiput is subshining black, very lightly brownish pollinose; the remainder of the occiput is densely gray pollinose. The antennae are black; the third segment is moderately long acuminate (fig. 112a). **Thorax:** Subopaque brown on the dorsum, gray on the sides and on the pleura. The humeri are dark brown to black, with a slight tinge of yellow on their hind margins. The halteres are entirely yellow, except for a very slight tinge of brown on the knobs. The propleural fan is made up of 10 to 12 gray hairs. The dorso-central hairs are rather small and the disc of the scutellum is bare. The scutellum has a row of about ten moderately strong, black bristles on its hind margins. The longest of these is about two-thirds the length of the scutellum. **Legs:** The coxae are dark brown to black. The trochanters are yellow-brown to black. The fem-

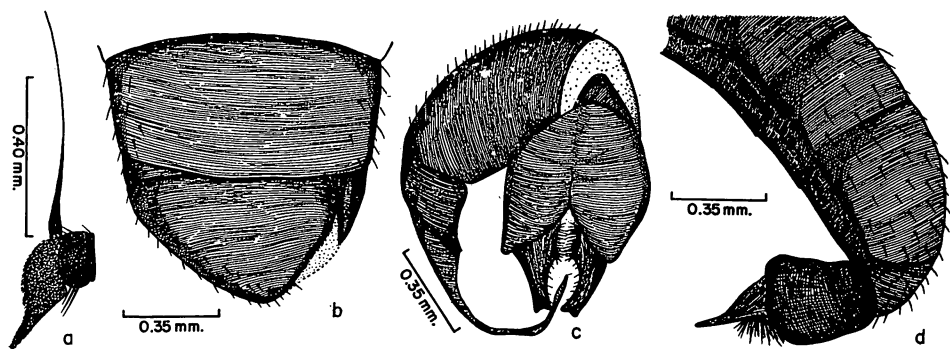


Figure 112—*Pipunculus sectus* n. sp.: a, antenna; b, apex of male abdomen, dorsal; c, male genitalia, ventral; d, abdomen of allotype female, lateral.

ora are predominantly black, very narrowly yellowed at the apices and bases. The tibiae are entirely yellow, and the basal segments of the tarsi are yellow. The femora are moderately thickened, and the flexor spines are well developed on all pairs. The hind tibiae have no strong setae on the outside surfaces. *Wings*: Distinctly infuscated; the stigma is brown and fills all of the third costal section; the third section is approximately equal in length to the fourth. The two sections combined are about equal in length to the fifth section. The r-m crossvein is situated at the basal one-third of cell 1st M_2 . The last section of vein M_{1+2} is moderately curved and the last section of vein M_{3+4} is shorter than the m crossvein. *Abdomen*: The first tergum is entirely gray pollinose; the other terga are grayish on the sides. The second tergum is subopaque, chiefly brownish; the third is brownish at the base and polished on the apical one-half. The fourth tergum is polished except for a narrow, opaque, brown base. The fifth is entirely polished except for a very narrow opaque, brown base. The first tergum has a clump of about eight strong black bristles arranged in two rows on each side; the remainder of the abdomen is rather sparsely setose. The hypopygium is about equal in length to the fifth segment as seen in dorsal view and is slightly pointed at the apex, with a large membranous area on the right side; the left side of the hypopygium is polished black. The ninth segment is plainly visible from a dorsal view (fig. 112b). From a ventral view the ninth segment extends three-fourths the distance to the apex of the eighth segment and the membranous area is not conspicuous unless the tip of the abdomen is twisted to one side. The ninth segment is about as wide as long and has a V-shaped cleft on its posterior margin. The sixth tergum is attenuated on the inner anterior border and is strongly curved beneath the claspers. The claspers are slender; they are about three to four times longer than wide and terminate in a subacute point on the inner apex (fig. 112c).

Length: body, 5.00–5.25 mm.; wings, 6.50–6.75 mm.

FEMALE. The upper two-fifths of the front is polished black and the front

is slightly expanded in the median portion. The wings are more hyaline than in the male. *Abdomen*: The sides are straight or nearly so. Terga two to four are predominantly brownish; gray on the sides and very narrowly grayish on the posterior margins. The fifth tergum is chiefly polished brown, very lightly brown pollinose over the basal half and on the sides. The sixth segment is rather well developed; it is almost half as long as the fifth segment. The base of the ovipositor is black, very faintly tinged with reddish. The piercer is yellow to rufous, is shorter than its base, and extends to about the apex of the second abdominal segment. The base of the ovipositor is moderately elongate, extending almost to the base of the fifth abdominal segment; it has a moderately strong tubercle on each side of the under portion (fig. 112d).

Length: body, 4.4 mm.; wings, 5.4 mm.

Holotype male and allotype female: Ridge south of Iao Valley, Maui, Sept. 14, 1919 (F. X. Williams). Thirty-six paratypes (all males) from the following localities: Same as type; Puu Kukui, Maui, *circa* 4,000 ft., June, 1953 (D. E. Hardy and C. R. Joyce); and Lanaihale, Lanai, 3,200 ft., June, 1953 (D. E. Hardy).

Type, allotype, and a series of paratypes in the Bernice P. Bishop Museum. The remainder of the paratypes are in the following collections: United States National Museum, British Museum (Natural History), and the University of Hawaii.

***Pipunculus (Pipunculus) swezeyi* Perkins (fig. 113a-e).**

Pipunculus swezeyi Perkins, 1905, Rept. Expt. Sta. Haw. Sugar Planters' Assn. Bull. 1 (4):154.

Endemic. Oahu (type locality: Pacific Heights, Honolulu). This species has been taken from a number of localities throughout the Koolau Range, Oahu.

Type in the Bernice P. Bishop Museum.

Host. The leafhopper hosts are unknown. Specimens have been taken in association with the sword ferns (*Nephrolepis* sp.). This is probably a parasite of *Nesosydne pipturi* Kirkaldy (see Swezey, 1912:160) and possibly *Nesodryas freycinetiae* Kirkaldy (see Perkins, 1905:155).

This species appears most closely related to *P. alienus* (Hardy) but is differentiated by the strikingly different genitalia of both sexes as seen in figures 85b, d and 113c, e; by the yellow third antennal segment; and by the entirely pollinose abdomen of the male. It looks superficially like *P. hawaiiensis* Perkins but lacks the strong bristles on the hind tibiae and differs in many other respects.

Following is a redescription of the type.

MALE. The eyes of the male are joined for about half the length of the front. The frontal triangle and the face are silvery gray pubescent. The upper portion of the front and the ocellar triangle are shining black. The occiput is gray pollinose, faintly subshining above. The first two antennal segments are brown, the third is yellow and moderately acuminate (fig. 113a). The mesonotum and scutellum are chiefly subshining black, rather lightly brownish pollinose; the

posterior calli, margins of humeri, and anterior corners and underside of the scutellum are yellowish. The humeri are brown, except for the margins. The halteres are chiefly yellow, the knobs are discolored with brown to black at their apices. The pleura are gray pollinose, predominantly black in ground color, tinged with yellow-brown on some portions. The tegulae and anterior basalar sclerites are yellow. The bristles of the propleural fan are brown. The dorso-central setae are well developed and erect. The scutellum has eight (six, seems to be average on other specimens) strong marginal bristles and has no hairs on the disc. The legs are all yellow, except for the brownish colored coxae. The hind tibiae have no strong bristles on the outside surface. Flexor spines are well developed on all the femora. The extensor hairs are present but are conspicuous only on the middle femora. Each middle coxa has a row of strong bristles at the apex on the anterior surface. The wings are lightly brownish tinged, almost hyaline on the basal one-third. The stigma is brown and fills all of the third costal section. The third section is about equal in length to the fourth and the two sections combined are just slightly longer than the fifth section. The r-m crossvein is situated at the basal one-third of cell 1st M_2 . The ultimate section of vein M_{1+2} is just slightly curved. The last section of vein M_{3+4} is about equal in length to the m crossvein. The abdomen is moderately pollinose, lightly subshining; it is chiefly brownish on the dorsum, gray on the first tergum and on the sides of the other terga, and faintly grayish at the extreme apices of segments two to four. The abdomen is rather thickly covered with short, erect, dark-colored setae. The sides are almost straight; the abdomen is broadest at about segment three. Hypopygium somewhat rounded as seen in dorsal view, with a large subapical membranous area covering all of the right side (fig. 113b). The eighth segment is about two-thirds as long as the fifth abdominal segment and the seventh tergum is visible from a dorsal view. From a ventral view, based upon homeotypic specimens, the membranous area almost completely bisects the eighth segment. The ninth segment is slightly longer than wide. The claspers are yellow and are similar in shape, produced outwardly at their apices, somewhat boot-like (fig. 113c). They are broad and blunt as seen in lateral view (fig. 113d).

Length: body, 5.0 mm.; wings, 6.4 mm. (Perkins gave the length as 4.0 mm.)

FEMALE. The female is similar to the male but the third antennal segment is longer acuminate, more like that of *P. hawaiiensis*. The front is shining black on the upper one-third to one-fourth and gray pollinose below. The front is expanded slightly in the median portion and the lower part is about equal in width to the face. The hairs which extend in a row down each eye margin are very conspicuous, especially on the upper half of the front; these hairs are convergent and nearly touch at their apices. The legs are as in the male except that the extensor hairs of the middle femora are not so bristle-like and conspicuous. The abdomen is chiefly brownish pollinose, slightly brownish on the dorsum in the median portions of terga two to five. The ovipositor is short and stubby, not extending much beyond the apex of the fourth abdominal segment. The base

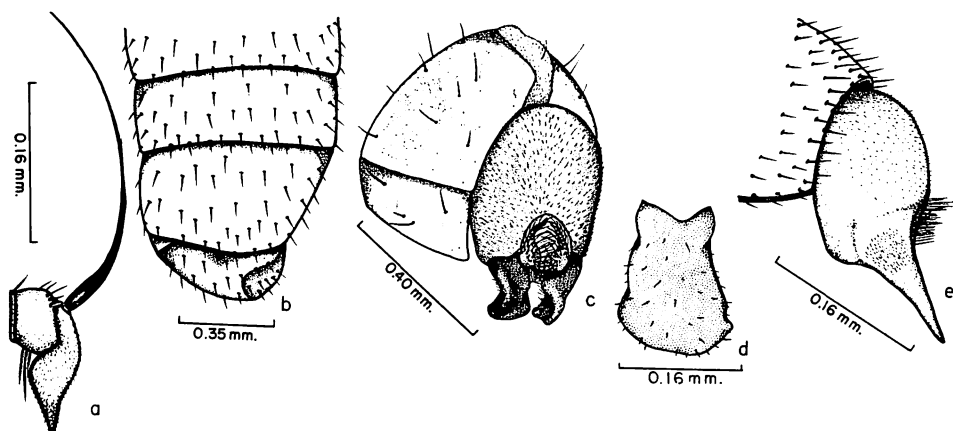


Figure 113—*Pipunculus swezeyi* Perkins: a, antenna (from type male); b, abdomen of type male, dorsal; c, male genitalia, ventral; d, clasper of male, lateral; e, female ovipositor, lateral.

is dark brown, tinged with reddish. The piercer is yellow and about equal in length to the base. The ovipositor is not strongly gibbose beneath but does have a slightly swollen area at the base of the piercer (fig. 113e). The ovipositor base is rather densely gray pubescent. The piercer has a dense patch of whitish pubescence on each side below the vaginal orifice.

Length: body, 4.5 mm.; wings, 6.3 mm.

***Pipunculus (Pipunculus) terryi* Perkins (fig. 114a–d).**

Pipunculus terryi Perkins, 1905, Rept. Expt. Sta. Haw. Sugar Planters' Assn. Bull. 1 (4):153.

Endemic. Kauai (type locality: Grove Farm, 21.58 n. 159.25w., Kauai). The lowland records of this species date from 1907 until 1918. I have studied the type and a series of specimens from the type locality and from Lihue, Kauai, July, 1907 (F. W. Terry). Since 1918 specimens have only been taken in the mountains in the Kokee region.

Type in the Hawaiian Sugar Planters' Association collection.

Hosts. Perkins in the original said that this species was found in sugar-cane fields on Kauai; it has been proved a parasite of the sugar-cane leafhopper, however. Specimens have been taken flying among the foliage of *Osmanthus sandwicensis* (Gray) Knobl. at Kokee.

This species is related to *P. juvator* Perkins and is distinguished by its entirely pollinose abdomen, by the less extensively darkened femora, by the shorter point to the third antennal segment, and by the genital characters of both sexes. The paler colored legs make this somewhat similar to *swezeyi* Perkins but the genitalia are very distinctive from those of *swezeyi* (cf. figs. 113c and 114c). The elongate ovipositor and paler coloration would ally this species to *P. perkinsiellae* (Hardy).

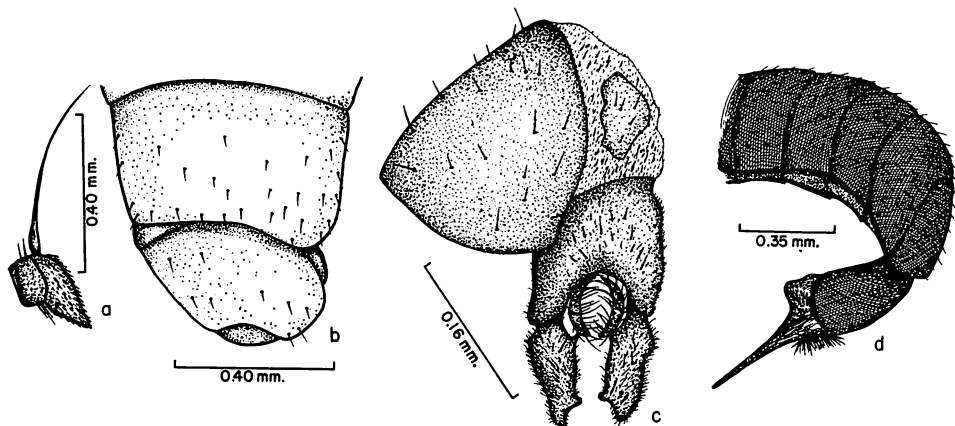


Figure 114—*Pipunculus terryi* Perkins: a, antenna (from type male); b, apex of male abdomen, dorsal (from type); c, male genitalia, ventral; d, abdomen of female, lateral.

The ovipositors of the two are, however, very differently developed (cf. figs. 109d and 114d).

MALE. The compound eyes are joined on the front for a distance equal to one and one-half times the length of the frontal triangle. The frontal triangle and the face are silvery gray pubescent, without a shining black area in the middle. The first two antennal segments are brown. The third segment is yellow, tinged faintly with red or brown and is acute below (fig. 114a). The thorax is as in *juvator*. The legs are similar to those of *juvator* except that the femora are largely brown, not black, and the bases of the segments are more broadly yellow. The tarsi are also all yellow or with only the apical segments tinged with brown. The wings are very similar to *juvator* but more lightly fumose, the third costal section is scarcely over half as long as the fourth, and the last section of M_{1+2} is but slightly curved. The abdomen is subshining brown to black, entirely pollinose, with no polished areas as in *juvator*. The hypopygium is opaque brown, about equal in length to the fifth abdominal segment, and with a conspicuous membranous area at the apex (fig. 114b). A small portion of the base of the ninth segment is usually visible from a dorsal view. The claspers are almost as long as the ninth segment and each is developed into a rather slender lobe at the outer apical margin. The membranous area completely bisects the eighth segment on the venter (fig. 114c).

Length: body, 3.4–3.8 mm.; wings, 4.2–4.6 mm.

FEMALE. The front is polished black on the upper one-fourth and gray pollinose on the lower portion. The first two antennal segments are yellow-brown and the third segment is more consistently yellow than in the male. The thorax is predominantly gray pollinose, faintly brown in the middle of the dorsum. The legs are chiefly yellow, with brownish discolorations in the median portion of each femur, especially toward the dorsal surface. The abdomen is predominant-

ly gray pollinose, opaque brownish to black in the median portions of terga two to six. The sides are nearly straight, the abdomen is slightly widest at the junction of segments four and five. The sixth segment is well developed and is nearly equal in length to the fifth. The ovipositor is well developed and conspicuous; it extends almost to the base of the abdomen. The base is opaque reddish brown in color and the piercer is shining yellow; the two portions are approximately equal in length. The ovipositor has a single tubercle beneath at the base of the piercer (fig. 114d).

Length: body, 3.2 mm.; wings, 4.0 mm.

Pipunculus (Pipunculus) timberlakei (Hardy) (fig. 115a-e).

Dorilas (Dorilas) timberlakei Hardy, 1953, Proc. Haw. Ent. Soc. 15 (1):70, fig. 6a-e.

Endemic. Hawaii (type locality: Keanakolu) and Oahu. Female specimens on hand from Maui appear to be this species, but the identity has not been confirmed.

Type in the United States National Museum.

Hosts. This species has been collected in association with *Nesosydne ipomoeicola* Kirkaldy and with a *Nesophrosyne* sp. on treefern (*Gibotium chamissoi* Kaulf.). It has also been collected flying over *Freycinetia arborea* Gaud. (ieie) on Hawaii and in association with leafhoppers on *Pipturus hawaiiensis*. Perkins (1913:CLXXXIII) said at least two species of *Pipunculus* were parasitic on *Nesosydne ipomoeicola*; *P. timberlakei* is probably one of the species which Perkins observed.

This species fits very close to *P. sectus* n. sp.; superficially the two are much alike. They are best differentiated by the differences in the male genitalia as shown in figures 112c and 115b. The females of *timberlakei* are characterized by the very poorly developed sixth abdominal segment.

Fitting the description of *P. sectus* in most respects, however, the third antennal segment is not so long acuminate (fig. 115a), the abdomen is less polished, and the genitalia are quite differently developed. The abdomen is predominantly opaque, gray on the first tergum, and brown over the second, third, basal three-fourths of the fourth, and basal one-fourth of the fifth tergum. The apices of the fourth and fifth terga and the left side of the eighth segment are polished black. The hypopygium is about two-thirds as long as the fifth abdominal segment and has a moderately large membranous area just to the right of the apex (fig. 115c). From a ventral view the membranous area completely bisects the eighth segment. The ninth segment is about as wide as long and has a U-shaped concavity in the middle of the hind margin. The claspers are about three times longer than wide, rather truncate at apices, and slightly pointed on the upper apical margin (fig. 115b). The sixth tergum is attenuated on the anterior margin and extends across the venter; however, the attenuated portion is not strongly curved upward as in *sectus*.

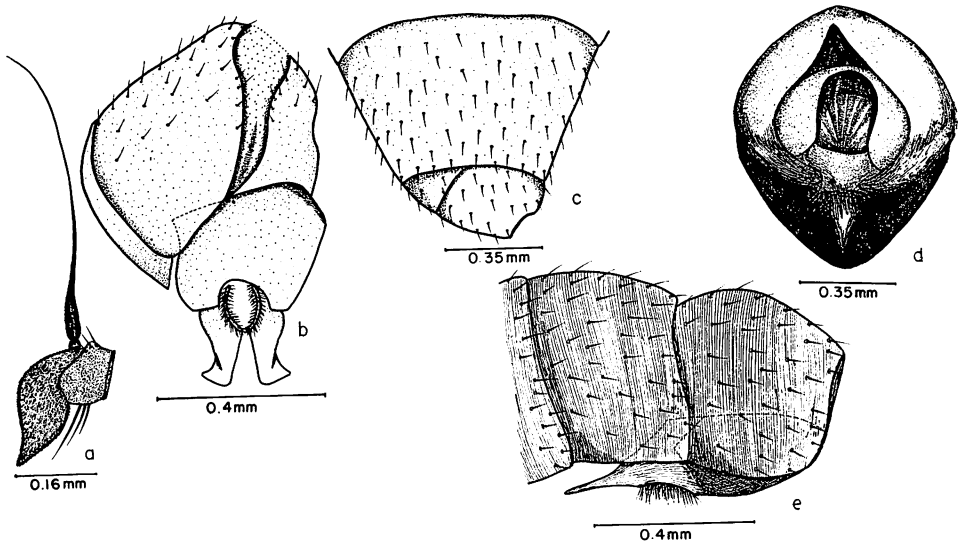


Figure 115—*Pipunculus timberlakei* (Hardy): a, antenna; b, male genitalia, ventral; c, apex of male abdomen, dorsal; d, apex of female abdomen, end view; e, female ovipositor, lateral.

In the female the upper half of the front is polished black. The third antennal segment is slightly more acuminate than in the male and the bases of the hind femora are more broadly yellowed. The abdomen is subopaque black, gray pollinose over the first two terga and on the sides of the remainder of the terga; terga three to five are dusted with brown dorsally. The sixth abdominal segment is very poorly developed and is usually not visible except in end view. As seen in end view, the sixth segment is deeply concave on its hind margin and is slightly tumescent on the sides (fig. 115d). The narrow sixth segment surrounds the base of the ovipositor. The base of the ovipositor is globose, the piercer is short and straight (fig. 115e).

Length of male: body, 4.2–4.5 mm.; wings, 5.0–6.0 mm. Length of female: body, 3.7–4.3 mm.; wings, 4.3–5.5 mm.

***Pipunculus (Pipunculus) titanus*, new species (fig. 116a–d).**

This large species is similar to *P. amplus* n. sp. but differs by having the mesonotum entirely opaque and the genitalia differently developed (fig. 116c). It appears rather closely related to *molokaiensis* Grimshaw but is much larger, and the male claspers are very differently developed.

MALE. *Head:* Similar to most Hawaiian *Pipunculus*. The upper portion of the occiput is subshining black, lightly dusted with brown pollen. The first two antennal segments are brown, faintly tinged with yellow. The third segment is clear yellow, short acuminate (fig. 116a). *Thorax:* Shining black in ground color, dusted with brown pollen on the dorsum, gray on the sides. The scutellum

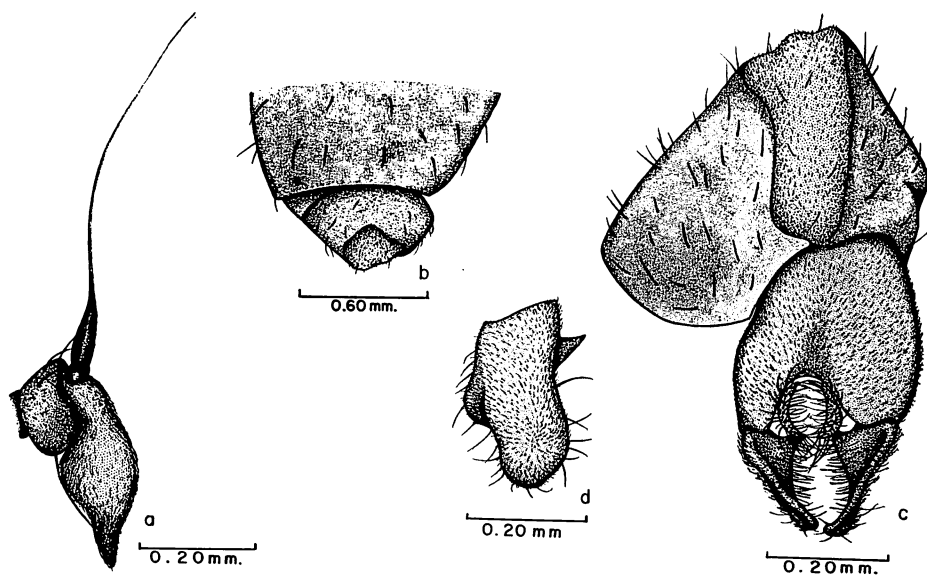


Figure 116—*Pipunculus titanus* n. sp.: a, antenna; b, apex of male abdomen, dorsal; c, male genitalia, ventral; d, male clasper, lateral.

has about twelve pairs of short, rather inconspicuous setae along the hind margin. The humeri are brown, faintly tinged with yellow. The knobs of the halteres are yellow-brown. The propleural fan contains four or five long yellow hairs. The metapleura and the metanotum are silvery gray pollinose. *Legs*: The coxae are black covered with gray pollen. The femora are predominantly black, rather broadly yellow at their bases and apices. The tibiae and tarsi are yellow, faintly tinged with brown, especially over the dorsal surfaces. Flexor spines are well developed on all femora. The front coxa has one or two short, black, anterior bristles at the apex. The middle coxa has a vertical row of four short, black, preapical anteroventral bristles. The hind tibia has no strong bristles on the swollen portion. *Wings*: Elongate, rather narrow, and distinctly infuscated with brown. The third costal section is equal in length to the fourth and the two sections combined are about one-third longer than the fifth costal section. The stigma is dark brown and fills all of the third costal section. The r-m crossvein is located at the basal third of cell 1st M_2 and the last section of vein M_{1+2} is gently curved. The last section of vein M_{3+4} is equal to or slightly longer than the m crossvein and the last section of vein $Cu_1 + 1st A$ is about half as long as the ultimate section of M_{3+4} . *Abdomen*: The first tergum is silvery gray pollinose and has six to eight rather strong black bristles on each side. The second tergum is opaque brown pollinose on the anterior median portion; otherwise terga two to five are polished black. The hypopygium is about three-fifths as long as the fifth abdominal segment and has a large membranous area covering the entire apex as seen in dorsal view (fig. 116b). From a ventral view, the

membranous area completely bisects the eighth segment. The ninth segment is about as wide as long and has a rather shallow concavity on the posterior margin. The claspers are rather slender, from a ventral view appearing thin and sharply-pointed (fig. 116c). From a lateral view the clasper is blunt, rounded at apex (fig. 116d).

Length: body, 6.3–6.7 mm.; wings, 7.9–9.2 mm.

FEMALE. Unknown.

Holotype male: Puu Kukui, Maui, *circa* 4,000 ft., elevation, June, 1953, flying among and over a dense growth of ferns in a heavily shaded, extremely wet area. Six male paratypes: Four same data as type (D. E. Hardy and C. R. Joyce); one on ridge s.w. Iao Valley, Maui, September 14, 1919 (F. X. Williams); and one Nahiku, Maui, January, 1908, collector not given.

Type and one paratype in the Bernice P. Bishop Museum. The remainder of the paratypes in the following collections: United States National Museum, British Museum (Natural History), and the University of Hawaii.

Pipunculus (Pipunculus) trichostylis, new species (fig. 117a–e).

This species fits near *P. chauliosternum* n. sp. and *proditus* n. sp. but differs by having the abdomen predominantly pollinose, polished black only on the apex of the fifth tergum, and by the very different genitalia as shown in figures 90c, 110c, and 117d.

MALE. *Head*: The junction of the compound eyes is nearly two times longer than the lower portion of the front. The upper portion of the front and the ocellar triangle are shining black, the lower portion of the front is gray pubescent. The face is silvery gray, slightly wider than the front above the antennae. The occiput is gray pollinose, faintly shining on the upper portion. The first two antennal segments are dark brown to black; the third segment is yellow, moderately long acuminate below, and densely pilose on the margin (fig. 117a). *Thorax*: Subshining black dusted with brown pollen on the dorsum, gray on the sides. The humeri are black, the knobs of the halteres are tinged with brown. The scutellum has eight to ten rather long black hairs on the hind margin. *Legs*: Predominantly yellow. The coxae are black covered with gray pollen. Each femur has a broad, brown to black band extending around the median portion. The tarsi are tinged with brown to black on the dorsal portions. Flexor spines are moderately developed on all femora, and a row of rather conspicuous extensor hairs extends down the posterodorsal surface of each femur. The hind tibia has three or four strong, erect setae on the outside of the swollen portion (fig. 117b). *Wings*: Faintly infuscated. The third costal section is scarcely over half as long as the fourth and the two sections combined are slightly longer than the fifth section. The stigma fills all of the third costal section. The r-m crossvein is situated near the basal third of cell 1st M_2 and the last section of vein M_{1+2} is gently curved. The last section of vein M_{3+4} is subequal to the m crossvein and the petiole of the cubital cell is about two-thirds as long as the r-m crossvein.

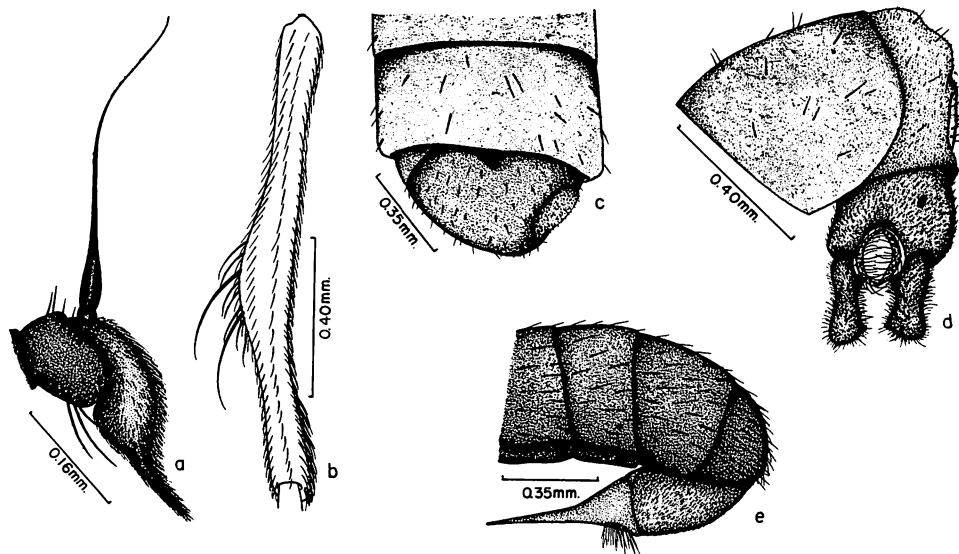


Figure 117—*Pipunculus trichostylis* n. sp.: a, antenna; b, hind tibia of male; c, apex of male abdomen, dorsal; d, male genitalia, ventral; e, female ovipositor, lateral.

Abdomen: Almost entirely brown pollinose, subshining; polished black only on the apex of the fifth abdominal segment. The abdomen is moderately setose, the first tergum has about four long setae plus several short setae on each side. The hypopygium is almost as long as the fifth abdominal segment and has a large membranous area confined to the right side (fig. 117c). As seen from a ventral view the membranous area very broadly bisects the eighth segment. The ninth segment is short and broad, almost two times wider than long. The claspers are about three times longer than wide, slightly curved upward as seen from a lateral view, and blunt at apices as seen from a ventral view (fig. 117d).

Length: body, 5.0 mm.; wings, 7.4 mm.

FEMALE. The female specimens at hand which appear to belong with the males lack the strong, erect setae on the hind tibiae and I cannot be sure that they are correctly associated; they are not being included in the type series. They would run in the key to *uluhe* (Hardy). The specimens fit the characteristics given for the male in most details, except that they are smaller in size, the wings are not so elongate in proportion to the body length, and the abdomen is entirely pollinose with no bare, polished area at the apex of the fifth tergum. The front is expanded in the median portion, the upper half of the front is polished black, the lower half is gray pollinose. The ovipositor base is not tuberculate ventrally; the piercer is yellow, straight, and extends about halfway to the base of the second abdominal segment (fig. 117e). The hind tibiae have no erect setae on the outside of the swollen portion.

Length: body, 4.35 mm.; wings, 5.00 mm.

Holotype male: Waikamoi, Maui, 4,000 ft. elevation, August, 1958, collected

flying among fern plants (D. E. Hardy). Eleven paratypes (all males) from the following localities: seven, same data as type; and four from Paliku, Haleakala Crater, Maui, 6,400 ft. elevation, June, 1952, June, 1953, and August, 1958 (D. E. Hardy and C. R. Joyce). Five female specimens are on hand, same data as type.

The type, two paratypes, and two of the above females are in the Bernice P. Bishop Museum. The remainder of the types are being deposited in the following collections: United States National Museum, British Museum (Natural History), and the University of Hawaii.

Pipunculus (Pipunculus) uluhe (Hardy) (fig. 118a-f).

Dorilas (Dorilas) uluhe Hardy, 1953, Proc. Haw. Ent. Soc. 15 (1):72, fig. 7a-e.

Endemic. Maui (type locality: Makamakaole Valley), Molokai, Lanai, and possibly Hawaii. The latter three are new island records. Specimens are on hand from Pepeopae, Molokai, 4,000 ft., July 30, 1959 (D. E. Hardy), and Lanaihale, Lanai, 3,200 ft., June, 1953 (D. E. Hardy). The species is rather common in the mountains of Maui. A series of specimens on hand from Hawaii (Pauahi, Kukai-au, and Kau) appear to be this species. They are distinctly smaller, however, than specimens from Maui and Molokai. Female specimens on hand from Wai-kamoi, Maui, seem to fit *uluhe* except that they possess large conspicuous processes at the base of the ovipositor (fig. 118f). This may possibly represent a distinct species or they may be aberrant specimens.

Type in the United States National Museum.

Hosts. This species has been collected in association with a leafhopper of the genus *Nesophrosyne* sp. on false staghorn fern (*Dicranopteris linearis* (Burm.)).

Externally, this resembles several other species of the complex which is characterized by having strong, erect setae on the swollen portion of the hind tibia, the apical portion of the abdomen polished black, and the male hypopygium with the membranous portion confined to the right side. It is best differentiated by the shape of the male claspers as shown in figure 118c. The female specimens fit near *P. delomeris* n. sp. but apparently differ by having the tibiae yellow and the femora broadly yellow at bases and apices.

The first two antennal segments are black; the third segment is yellow, long acuminate below (fig. 118a). The thorax is entirely black, lightly subshining on the dorsum, thinly brownish pollinose; the pleura are gray. The scutellum has about eight long hairs on the hind margin, the longest of these one-half to three-fifths as long as the scutellum. The legs are predominantly yellow, the femora broadly ringed with black. Flexor spines and extensor hairs are well developed on all femora. Each hind tibia has two strong, black bristles on the outside of the swollen portion. The wings are infuscated, especially on the apical three-fourths. The third costal section is slightly shorter than the fourth, and the two sections combined are approximately equal in length to the fifth section.

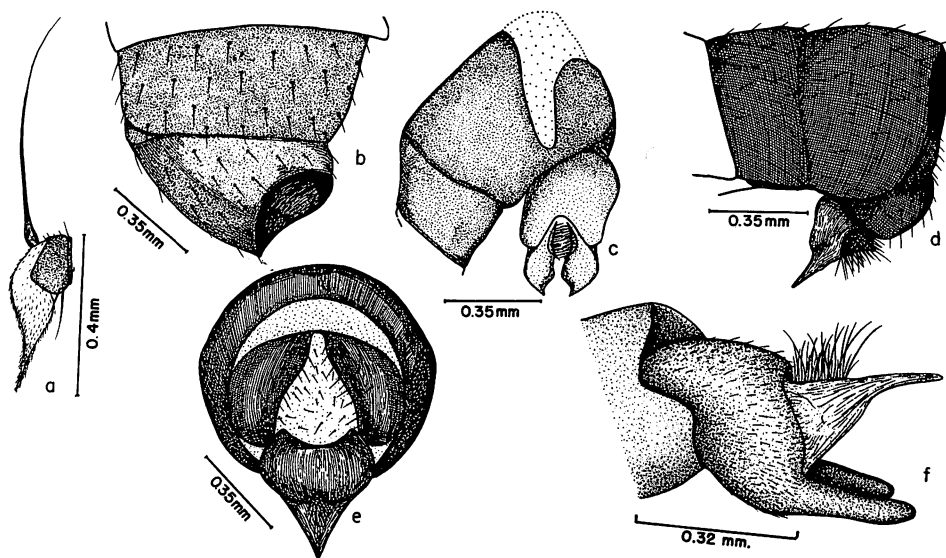


Figure 118—*Pipunculus uluhe* (Hardy): a, antenna; b, apex of male abdomen, dorsal; c, male genitalia, ventral; d, apex of female abdomen, lateral; e, apex of female abdomen, end view; f, female ovipositor, lateral (aberrant specimen from Maui).

The r-m crossvein is situated just beyond the basal third of cell 1st M_2 and the last section of vein M_{1+2} is gently curved. The second and third abdominal terga are brownish gray pollinose. The fourth tergum is polished black on the apical half and gray-brown pollinose on the basal portion. The fifth tergum is entirely polished black except for the very narrow gray-brown line along the basal margin. The abdomen is sparsely pilose. The hypopygium is compressed to the right and has a large subapical membranous area on the right side (fig. 118b). From a ventral view, the membranous area almost completely bisects the eighth segment. The ninth segment is approximately as wide as long and has a moderately deep concavity on the hind margin. The claspers are rather short and each is pointed at the apex (fig. 118c). In the female the upper one-third of the front is polished black, the remainder is gray. The abdomen is subopaque gray to gray-brown pollinose. The sixth abdominal segment is poorly developed and is scarcely visible in a direct dorsal view. From an end view, the sixth segment is deeply concave on the posterior margin (fig. 118e). The ovipositor is small and conspicuous, usually completely hidden beneath the venter of the abdomen. The base is globose, with small to large ventral tubercles which are hidden beneath the abdomen when in resting position. The piercer is short and straight, slightly swollen beneath (fig. 118d).

Length of male: body, 4.0–4.5 mm.; wings, 6.0–6.5 mm. Length of female: body, 3.8–4.0 mm.; wings, 5.7–6.0 mm.

Family SYRPHIDAE Latreille
Hover Flies, Drone Flies, and Flower Flies

Syrphiae Latreille, 1802, Hist. Nat. Crust. et Ins. 3:449.

Syrphidae Samouelle (ex Leach), 1819, The Entomologist's Useful Compendium, p. 296.

The family name is derived from the Greek "*syrphos*," a small winged insect, a kind of gnat, or winged ant.

Medium-sized to large flies, usually bright colored, conspicuously marked with yellow and black or metallic blue or green. They are often densely pilose and sometimes bee- or wasp-like in appearance. The Hawaiian species range in size from 5.25 to 17.50 mm. The members of the family are characterized by the distinctive wing venation, with a spurious vein present in all of the Hawaiian species extending longitudinally through the middle of the wing between radius and medius and across the r-m crossvein (figs. 123d, 130b, and 135b). The shape of the head, as seen in lateral view, and the antennae are distinctive (figs. 122a, 125a, 127a, and 135a). The antennae are usually short, rounded or oblong, and each has a dorsal arista. The face varies considerably in shape; a moderately large gibbosity is usually present in the middle of the face above the epistoma, and in the *Volucella* Geoffroy the epistoma is distinctly produced. In *Eumerus* Meigen the face is almost flat (fig. 125a) and in *Syritta oceanica* Macquart the face is distinctly concave (fig. 132a). Other details of the body and legs are often important in differentiating the Syrphidae. The male genitalia are similar to those of the Pipunculidae. The posterior portion of the male abdomen beyond segment five is strongly twisted to the left. The sixth and seventh terga are lateral in position and extend onto the venter; the eighth segment is terminal and is usually rounded, rather symmetrical. The ninth segment is ventral in position and the claspers face anteriorly (fig. 134a). The male genital structures appear to be of considerable importance in differentiating genera and species. For details on the male genitalia, refer to Fluke (1950 and 1957), Metcalf (1921), and Stuckenberg (1954a and 1954b). The female genitalia are quite differently developed from those of the Pipunculidae and are not fitted for piercing.

From a world standpoint this is one of the largest families of the Diptera and includes some of the most attractive and most commonly seen flies. Hull (1949:257) said that over 4,700 species had been recorded up to 1945 plus 72 fossil species. The adults are most commonly taken on blossoms, where they feed on the nectar and pollen. Probably most syrphids are beneficial because of the part the adults play in the cross-pollination of plants. The larvae of the subfamily Syrphinae are aphid and mealy bug predators and are of considerable importance as biological control agents. Some species are plant feeders and may do serious damage to bulb and tuber plants. The habits of the larvae are very diverse; in comparison to the large number of described species very little is known of the immature stages. Four distinct types of larvae occur in the family.

The subfamily Microdontinae (none of which is represented in Hawaii) are characterized by lacking anterior spiracles and having a hard, rather leathery, sculptured integument. *Volucella* Geoffroy and *Syritta* Lepeletier and Serville (in Hawaii), are characterized by having short posterior respiratory tubes; these breed in rotting vegetation. The *Eristalis* Latreille (in Hawaii) are characterized by having the posterior spiracles close together at the end of an elongate, retractile, tracheal tube (rat-tailed) one to three or more times as long as the body. These breed in water which is highly contaminated with rotting organic matter. The subfamily Syrphinae are distinguished by having well-developed piercing mouthparts and by being pointed anteriorly and truncate posteriorly with the posterior spiracles reduced. The latter are predominantly aphid predators; however, some species feed upon mealy bugs. For information concerning the biologies of some of the Hawaiian species, refer to Williams (1931:284-290 and 1939:284-288).

The genera of Syrphidae known to be established in Hawaii may be segregated into the following groups according to the breeding habits of the larvae:

1. Breeding in liquid filth: *Eristalis* Latreille.
2. Breeding in rotting plant material: *Volucella* Geoffroy and *Syritta* Lepeletier and Serville.
3. Predators on aphids and possibly mealy bugs: *Ischiodon* Sack and *Allograpta* Osten Sacken.
4. Phytophagous:
 - a. Living on foliage of plants, *Mesograpta* Loew.
 - b. Boring in bulbs and tubers, *Eumerus* Meigen.

Several species of rat-tail maggots (*Eristalis* Latreille and *Helophilus* Meigen) have been involved in apparently authentic cases of intestinal myiasis which have been reported in the literature. (Refer to Hall and Muir, 1913; Hall, 1918; James, 1947:149-154; and Austen, 1912.) No such cases have been reported in Hawaii.

Fourteen species of Syrphidae are presently known to be established in Hawaii; this includes *Syritta aenigmatopatria*, n. sp., which has not been previously recorded. Several species have been purposely introduced into the islands as biological control agents. Three species (accidental introductions, however) of aphid, and mealy bug, predators are known to be established. *Merodon equestris* Fabricius has been intercepted by plant quarantine inspectors in daffodil bulbs, but is not known to be established. The other species of Syrphidae in Hawaii are accidental immigrants. Four of these were recorded by Howard (1901) and Grimshaw (1901). Apparently the earliest recorded collection of a syrphid in Hawaii was of *Ischiodon grandicornis* (Macquart) (under the genus *Xanthogramma*) from specimens collected on Hawaii and Oahu in 1892.

In the taxonomic treatment to follow, I am using the subfamily arrangement of Hull (1949). Refer to the latter reference for information on evolution, morphology, and subfamily and generic classification.

KEY TO THE GENERA AND SPECIES OF SYRPHIDAE WHICH HAVE BEEN
RECORDED FROM HAWAII

1. Vein R_{4+5} curved downward, looping into the middle of cell R_5 (fig. 135b). Each femur with a patch of black setulae near the base anteriorly. *Eristalinae*.....2
 Vein R_{4+5} not curved downward into cell R_5 . At least hind femora lacking patches of basal setulae.....5
- 2(1). Cell R_1 open in the wing margin. Each hind femur with a strongly raised spur-bearing subtriangular plate or ridge. Tribe Helophilini.....**Merodon** Meigen.
 Cell R_1 closed (fig. 135b). Hind femora not as above.
 Tribe *Eristalini*.....3
- 3(2). Eyes densely pilose and unicolorous. Mesonotum not vittate.....**Eristalis tenax** (Linnaeus).
 Lower two-thirds of the eyes bare, upper one-third inconspicuously short pilose, sometimes almost entirely bare. Eyes light brown, covered with dark brown to black spots (figs. 134c, 135a). Mesonotum with gray longitudinal vittae. **Eristalis** (**Lathyrophthalmus**) Mik4
- 4(3). Body and head entirely blue-black in ground color. Mesonotum shining black with five gray longitudinal vittae. Legs predominantly black.....**aeneus** (Scopoli).
 Face yellow. Thorax predominantly yellow to rufous in ground color, mesonotum with four shining black longitudinal vittae. Legs predominantly yellow. Abdomen conspicuously marked with broad, yellow pollinose bands.....**arvorum** (Fabricius).
- 5(1). Arista plumose. Face strongly produced below (fig. 127a). Volucellinae. **Volucella** Geoffroy.....6
 Arista bare. Face not strongly produced below, sometimes gibbose in the median portion.....9
- 6(5). Face with prominent lateral swellings (fig. 127a). Large metallic blue, green, or violaceous species, 11.0–12.5 mm. in length
**Volucella** (**Ornidia**) **obesa** (Fabricius).
 Face with only the median swelling (fig. 129a). Small species, 6.5–7.5 mm. Not colored as above.....7
- 7(6). Wings with three transverse brown markings (fig. 130b). No depression present on the scutellum.

- Cell R_1 closed and petiolate. No black bristles present on sides of mesonotum.....
**Volucella (Volucella) tamaulipana** Townsend.
 Wings evenly yellowish fumose, slightly darker along the veins but with no brown crossbands. Scutellum with three depressed areas. Cell R_1 often open. Sides of mesonotum with black bristles. **Volucella (Phalacromyia)** Rondani8
- 8(7). Scutellum with large lateral depressions, these are about as long as wide. Front of male yellow, tinged with brown. Femora black, at least on the basal third. Sternopleura and lower pteropleura dark brown to black.....**tricincta** Bigot.
 Scutellum with weak lateral depressions; sometimes hardly discernible and distinctly wider than long. Front of male black. Femora rufous or brownish red. Sternopleura and lower pteropleura rufous or brownish red**dracaena** Curran.
- 9(5). Third antennal segment about as broad as long (fig. 125a). Apex of cell R_5 strongly produced, convex, and with an appendix in the median portion (fig. 125c). Face recessive, undeveloped at epistoma, and not gibbose (fig. 125a). Eumerinae. **Eumerus** Meigen 10
- Third antennal segment longer than wide. Apex of cell R_5 not strongly curved outwardly and without an appendix. Face well developed at epistoma or with a conspicuous gibbosity.....11
- 10(9). Eyes densely pilose. Apical four segments of hind tarsus white, strongly flattened and broad in the male (fig. 125b). Scutellum entirely black.....
**aurifrons** (Wiedemann).
 Eyes bare. Hind tarsi yellow-brown, not flattened. Apex of scutellum yellow to white.
**marginatus** Grimshaw.
- 11(9). Hind femora strongly swollen and armed with teeth beneath (fig. 133a). Abdomen long and slender, straight-sided. Humeri pilose.
**Syritta** Lepeletier and Serville 12
- Hind femora slender, unarmed. Abdomen not so elongate and linear-sided, clavate in the genus **Baccha** Fabricius. Humeri bare14

- 12(11). Front and middle femora, lower portion of face, and ground color of humeri and third antennal segment brown to black. Face concave (fig. 132a). Upper two-thirds of female front entirely shining black. Junction of eyes of male, short, scarcely over one-half as long as the pollinose portion of the front above the junction. Hind femur with a prominent ventral tubercle near base (fig. 132b). Male genitalia as in figure 132c *oceanica* Macquart.
 Front and middle femora, at least the lower face, humeri, and antennae yellow. Face straight or nearly so. Front of female with gray markings on the upper one-fourth. Junction of eyes in male about equal in length to the pollinose portion of the front above the junction. Ventral tubercle not as above and male genitalia different 13
- 13(12). Second and third terga of male, each with a broad band of yellow which is sometimes slightly interrupted medianly by a reddish or brownish discoloration. Fourth tergum of male black, often tinged with reddish brown, with a faint bluish sheen in direct light, and with a rather broad band of yellow across the apex (fig. 131a). Hind femora entirely black, each with a close set group of three to five anteroventral teeth near the base, especially pronounced in the male (fig. 131b). Hind tibia of male with a raised area in the middle below. Male genitalia as in figure 131d..... *aenigmatopatria* n. sp.
 Second and third terga typically with a narrow black median line separating the yellow marks. Fourth tergum blue-black and narrowly yellow at the apex. Hind femora rufous ventrally, about five evenly-spaced anteroventral teeth are present on the basal half of the femur (fig. 133a). Ventral surface of male tibia straight. Male genitalia as in figure 133b *orientalis* Macquart.
- 14(11). Abdomen petiolate (fig. 124a). Elongate, slender species *Baccha clavata* (Fabricius).
 Not as above 15
- 15(14). Abdomen margined, caused by a sublateral crease on each side; the immediate lateral margins are flattened, slightly raised, and not curved under 16
 Abdomen not margined, sides curved under 20

- 16(15). Metasternum bare. Male genitalia not enlarged.....17
 Metasternum pilose. Male genitalia greatly enlarged;
 claspers elongate and projecting.....
**Eupeodes volucris** Osten Sacken.
- 17(16). In lateral view, the head is broadest at the swelling
 just above the oral margin (fig. 123e). Mesonotum
 conspicuously marked with yellow on the sides.
 Front yellow pilose19
 In lateral view, the head is as broad or broader at the
 antennae than above the oral margin (fig. 122a).
 Mesonotum all black in ground color and covered
 with submetallic gray pollen. Front black pilose.....18
- 18(17). Yellow spots on second tergum reaching lateral mar-
 gins. Genae yellow.**Syrphus opinator** Osten Sacken.
 Yellow spots not reaching lateral margins. Genae
 black
**Metasyrphus (Posthosyrphus) wiedemanni** (Johnson).
- 19(17). Mesonotum shining black. Costa and apex of vein
 R_{4+5} end distinctly above the wing apex. Genae
 and scutellum yellow. Abdominal markings as in
 figure 123a. Yellow marks on third and fourth terga
 not interrupted with two black lines medianly. Male
 genitalia as in figure 123c.
**Ischiodon grandicornis** (Macquart).
 Mesonotum brownish pollinose but with a narrow
 cinereous line extending longitudinally down the
 middle. Costa and apex of vein R_{4+5} end at, or
 very near, the wing apex. Genae black. Scutellum
 usually black on the disc, yellow around the mar-
 gins. Abdominal markings as in figure 121b; two
 black, longitudinal vittae interrupt the yellow
 marks in the middle of the third and fourth terga
**Mesograpta marginata** (Say).
- 20(15). Face yellow. Scutellum predominantly or entirely yel-
 low. Face with a prominent swelling above epistoma
 (fig. 119a)21
 Face and scutellum black. Face recessive below, lack-
 ing a prominence above epistoma
**Melanostoma stegnum** (Say).
- 21(20). Mesonotum polished black; notopleura yellow. The
 third tergum of the abdomen has a broad, black,
 apical band; terga four and five each has three

- longitudinal black vittae (fig. 120a) or three black longitudinal marks as in figure 119b. Male genitalia very small, not over one-third as wide as fifth abdominal segment. The tubercle on the face extends well beyond the epistoma (fig. 119a). *Allograpta* Osten Sacken.....22
- Mesonotum subshining black on sides (inside the yellow markings) and with a shining black line extending down the middle and a pair of grayish pollinose, submedian longitudinal stripes. Male genitalia greatly enlarged, about as wide as fifth abdominal segment. Epistoma extending forward nearly as far as tubercle.*Sphaerophoria sulphuripes* (Thomson).
- 22(21). Scutellum entirely yellow. Third abdominal segment with a broad, black band across the base. Segments four and five with three black longitudinal vittae extending the full length of the segment (fig. 120a)23
- Scutellum with a large black spot in the middle. Anterior margins of third and fourth terga each with a black spot in the middle and a black spot on each side. Fourth and fifth terga each with three black longitudinal marks arranged on the posterior portion of segment as in figure 119b.*cubana* Curran.
- 23(22). Pleura yellow behind the mesothoracic spiracle. Hypopleura each with a yellow spot on the upper portion continuous with the yellow markings on the sternopleura and metapleura. Yellow spot on pteropleuron, below wing, continuous with the spot on the mesopleuron.....*obliqua* (Say).
- Pleura black behind mesothoracic spiracle. Hypopleura entirely polished black. Yellow spot on pteropleuron, below wing, not extending over top edge of pteropleuron.....*exotica* (Wiedemann).

Subfamily SYRPHINAE Latreille

Syrphiae Latreille, 1802, Hist. Nat. Crust. et Ins. 3:449.

The members of this subfamily are differentiated by having the humeri bare, the arista dorsal, the r-m crossvein placed well before the middle of cell 1st

M₂, and the femora simple with no basal patches of setae. The face has a moderate gibbosity in the middle above the epistoma (fig. 122a).

Most of the species of this subfamily are aphid predators and some are known to prey upon mealy bugs. Four species (one *Eupeodes* Osten Sacken, one *Allograpta* Osten Sacken, one *Metasyrphus* Matsumura, and one *Baccha* Fabricius) were purposely introduced into Hawaii as natural enemies of plant lice. These have apparently failed to become established. Three other predaceous species (two *Allograpta* Osten Sacken and one *Ischiodon* Sack) have been accidentally introduced and are now widespread throughout the islands. One other accidentally introduced species of this subfamily, *Mesograpta marginata* (Say), is now very abundant. It is thought to be a plant feeder, but its habits are unknown in Hawaii. Species of *Melanostoma* Schiner, *Syrphus* Fabricius, and *Sphaerophoria* Lepeletier and Serville have been intercepted in quarantine or have been reared from vegetables shipped in from California but are not known to be established.

Species belonging in three tribes (Syrphini, Bacchini, and Melanostomini) have been recorded in the Hawaiian literature.

Tribe SYRPHINI Latreille

Syrphiae Latreille, 1802, Hist. Nat. Crust, et Ins. 3:449.

Six genera of Syrphini have been recorded in the Hawaiian literature. Only three of these (*Allograpta* Osten Sacken, two species; *Mesograpta* Loew, one species; and *Ischiodon* Sack, one species) are known to be established. The species of *Eupeodes* Osten Sacken, *Metasyrphus* Matsumura, *Syrphus* Fabricius, and *Sphaerophoria* Lepeletier and Serville have not been seen since they were introduced, or since they were reported on imported vegetables in local markets.

Genus ALLOGRAPTA Osten Sacken

Allograpta Osten Sacken, 1876, Bull. Buffalo Soc. Nat. Hist. 3:49.

These flies are similar in most respects to members of the genus *Syrphus* Fabricius and are differentiated by having the lateral margins of the abdomen curved downward, not marginate. Some authors have treated this as a subgenus of *Epistrophe* Walker differing by having the sides of the mesonotum dark in color and the fourth and fifth abdominal terga with three black longitudinal vittae (fig. 120a). Dr. W. W. Wirth, Insect Identification and Parasite Introduction Research Branch, U. S. Department of Agriculture, says that the U. S. National Museum treats *Allograpta* as a full genus.

Two species are known to occur in Hawaii.

Type of genus: *Scaeva obliqua* Say.

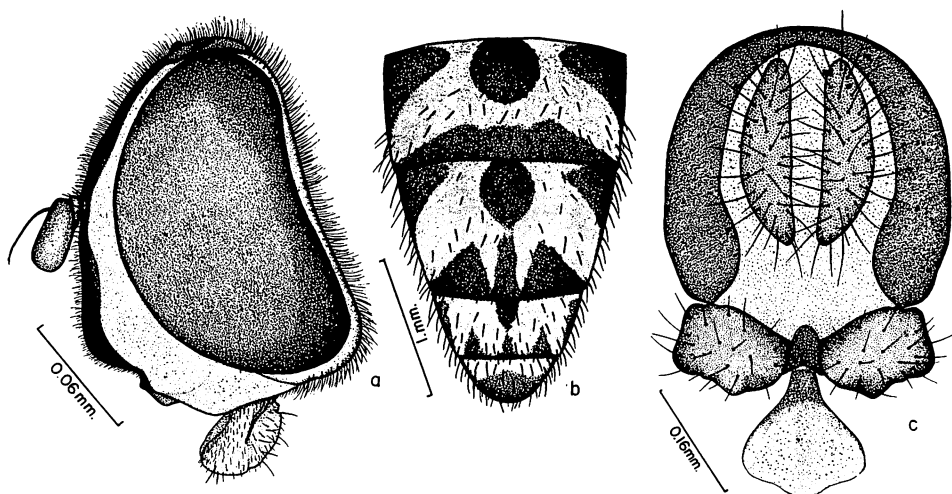


Figure 119—*Allograpta cubana* Curran: a, head, lateral; b, abdomen, dorsal; c, male genitalia, ventral.

***Allograpta cubana* Curran (fig. 119a-c).**

Allograpta cubana Curran, 1932, Amer. Mus. Novit. 519:3.

Allograpta sp. Weber, 1954, Proc. Haw. Ent. Soc. 15 (2) :369.

This species was introduced as an aphid predator and was liberated in Kai-muki, Oahu, on April 30, 1953 (see Weber, 1954:369). It is not known to be established. The type is in the American Museum of National History.

A. cubana is closely related to *A. venusta* Curran from the Virgin Islands, but according to Curran (*loc. cit.*) "the black median spots on the third and fourth abdominal segments are short-oval or orbicular instead of triangular and are not produced posteriorly in the middle." Fluke (1942:17) also distinguished it by these characters.

I am not sure that the shapes of the spots on the third and fourth abdominal terga are wholly reliable as specific characters. Of the four specimens on hand (three females and one male from the original introduction), only one female perfectly fits the concept of the species stated above by Curran and by Fluke (see Fluke *loc. cit.*, fig. 39). The other three specimens show intergradation from the pattern of typical *cubana* to that of *venusta*, where the median black spots are longer than wide and triangular in shape. The male specimen (fig. 119b) is intermediate between the rounded and the triangular markings.

This species is readily differentiated from the two *Allograpta* known to be established in Hawaii by the large black spot in the middle of the scutellum and by the differences in the markings on the abdomen as shown in figures 119b and 120a. The markings of the mesonotum and pleura are almost exactly like those of *A. exotica*, and the head shape (fig. 119a) is very similar in the two species.

In *exotica*, however, the upper portion of the front of the female is distinctly broader and more extensively blackened than in *cubana*. In the male of *exotica* the front is predominantly yellow with a rather small black spot just above and between the antennae; in *cubana* the front is predominantly black with a rather narrow rim of yellow around the eye margins. Also the subapical brown to black band on the hind femur and the basal and apical bands on the hind tibia are much more distinct in specimens of *cubana*. The head shape, in profile, is as in figure 119a, and the male genitalia are as in figure 119c.

Length: body, 7.0–7.5 mm.; wings, 5.5–6.0 mm.

Allograpta exotica (Wiedemann) (fig. 120a–b).

Syrphus exoticus Wiedemann, 1830, Ausser. Zweifl. Ins. 2:136.

Allograpta fracta Osten Sacken, 1877, Bull. U. S. Geol. and Geog. Surv. 3: 331.

Allograpta skottsbergi Enderlein, 1940, in Skottsberg Nat. Hist. Juan Fernandez and Easter Island, Zool. 3 (5) :663.

Probably on all main Hawaiian islands; no specimens have been seen, however, from Lanai.

Immigrant. Widespread over the Neotropical region and California.

This species was apparently an accidental introduction into Hawaii and was first reported by Weber (1948:219). Previous to this time it probably had been confused with *A. obliqua*. The earliest known Hawaiian record is Wailau Valley, Molokai, July, 1933.

Hosts. This is an important aphid predator and is especially common in association with the corn leaf aphid (*Aphis maidis* Fitch). The species is often heavily parasitized by *Diplazon laetatorius* (Fabricius).

This species is rather similar in appearance to *A. obliqua* (Say) but differs by having a black marking on each side of the pleura posterior to the mesothoracic spiracle; by the entirely polished black hypopleura; and by a small yellow spot on each pteropleuron below the wing base which does not extend completely over the upper edge of this sclerite. Also the face has a prominent black line extending vertically through the median portion. The color pattern of the abdomen is shown in figure 120a and the male genital characters in figure 120b.

Length: body, 5.50–7.25 mm.; wings, 5.00–5.70 mm.

Allograpta obliqua (Say) (fig. 120c).

Scaeva obliqua Say, 1823, Jour. Phila. Acad. Nat. Sci., 3:89.

For synonymy, refer to Fluke (1956:209).

Widespread throughout the islands.

Immigrant. Nearctic and Neotropical regions. First recorded in the islands

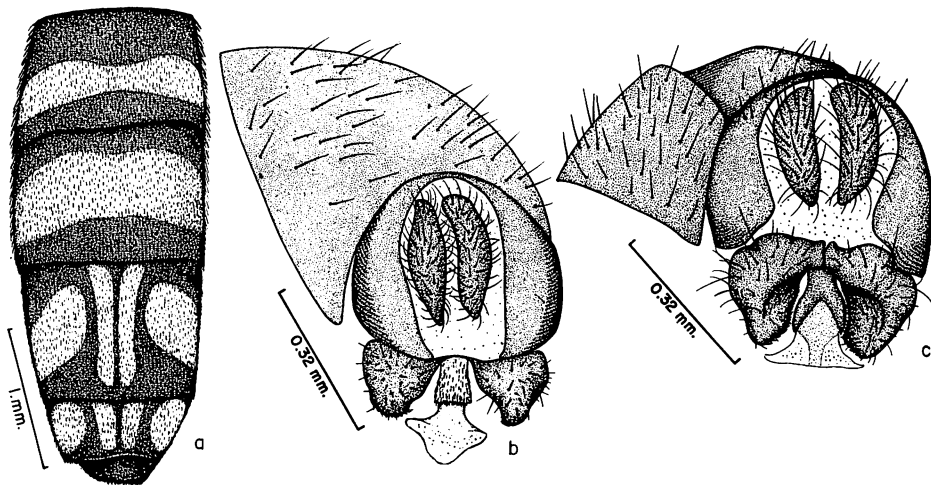


Figure 120—*Allograpta exotica* (Wiedemann): a, abdomen, dorsal; b, male genitalia, ventral. *A. obliqua* (Say): c, male genitalia, ventral.

in 1920 by Timberlake (1921:456) and collected on corn infested with *Aphis maidis* Fitch.

This species is a very valuable aphid and mealy bug predator. In Southern California it is well known as an enemy of plant lice on citrus and truck crops (refer to Davidson, 1916:456). In Hawaii it has been found feeding on several species of aphids and is especially common in association with the corn leaf aphid (*Aphis maidis*). Swezey (1926:226) has reared it from colonies of *Ferrisiana virgata* (Cockerell) (as *Pseudococcus virgatus* Cockerell). I have reared this species in association with *Pseudococcus adonidum* (Linnaeus).

Davidson (1922:47) observed that young larvae of *A. obliqua* are able to sustain themselves, at least for the first few days of their larval life, on plant food. He also indicated that other aphidophagous Syrphidae may possibly be phytophagous and entomophagous in the larval stages.

The species is often heavily parasitized by *Diplazon laetatorius* (Fabricius) (see Swezey 1929:282). According to Clausen (1940:5) this parasite oviposits either in the egg or in the larva of the syrphid fly and the adult emerges from the puparium.

This species is differentiated from *A. exotica* by having the area posterior to the mesothoracic spiracle yellow; the hypopleura each with a yellow spot on the upper portion, continuous with the yellow markings on the sternopleura and metapleura; and by having the spot on the pteropleuron, below the wings, continuous with the yellow marking on the mesopleuron. The median portion of the face is slightly darkened but lacks the black vertical stripe which is characteristic of *exotica*. The male genitalia are as in figure 120c.

Length: body, 5.75–7.75 mm.; wings, 5.40–6.75 mm.

Genus **MESOGRAPTA** Loew

Mesogramma Loew, 1865, Berl. Ent. Zeitsch. 9:157. Preoccupied by *Mesogramma* Stephens, 1850, List Brit. Animals, Brit. Mus., Lepidoptera, p. 183.

Mesograptia Loew, 1872, Berl. Ent. Zeitsch. 16:114. (See Fluke, 1953:208).

Small species, conspicuously marked with yellow on the abdomen and with the facial tubercle and epistoma yellow. The apex of the epistoma extends about as far as the tubercle (fig. 121a).

The Hawaiian species has been treated in the literature as *Toxomerus marginatus* (Say). Hull (1949:286) places *Toxomerus* as a subgenus of *Mesogramma* distinguished by having the hind femora of the males thickened and arcuate, each with an elongate basal protuberance, and the hind tibiae arcuate with the apices expanded and scoop-like. Our species apparently fits in typical *Mesograptia*.

Type of genus: *Syrphus boscii* Macquart.

On the mainland of the United States at least one species of *Mesograptia* (*polita* (Say)) has been incriminated as a pest of corn by Riley and Howard (1918), although Curran (1925:168) said this species is primarily a pollen feeder and is not injurious to corn. Folsom (1909) observed it feeding on the clover louse.

***Mesograptia marginata* (Say)** (fig. 121a-c).

Scaeva marginata Say, 1823, Jour. Phila. Acad. Nat. Sci. 3:92.

For synonymy, refer to Fluke (1956:225).

Widespread throughout the islands. Specimens have been seen from all the main islands except Lanai.

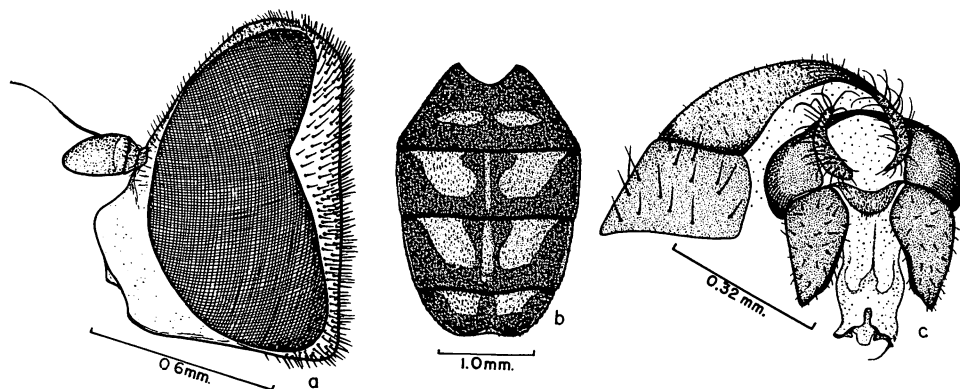


Figure 121—*Mesograptia marginata* (Say): a, head, lateral; b, abdomen, dorsal; c, male genitalia, ventral.

Immigrant. North and Central America. First reported in Hawaii by Swezey (1934:370). The earliest record is from Kokee, Kauai, June, 1932.

We have no information on the feeding habits of this species in Hawaii. Folsom (1909) and Smith (1923) observed the larvae feeding upon the clover aphid on the mainland of the United States.

This is the smallest of the Hawaiian Syrphidae; the body measures 5.25–6.00 mm. The front is metallic blue in ground color and the mesonotum is brownish pollinose with a narrow gray vitta extending longitudinally down the middle. The abdominal terga are marked with yellow submedian spots and a longitudinal yellow vitta extends down the middle of the abdomen. The abdominal pattern is as in figure 121b. The face has a moderately strong gibbosity above the epistoma as in figure 121a. The male genitalia are as in figure 121c.

Genus **EUPEODES** Osten Sacken

Eupeodes Osten Sacken, 1877, Bull. U. S. Geol. Surv. 3:328.

These are small *Syrphus*-like flies distinguished by the pilose metasternum and in the typical subgenus by the greatly enlarged, polished male genitalia with the claspers elongate and projecting. The sides of the abdomen are marginate, the metasternum is bare or pubescent, and the squamae are bare.

This has been treated as a subgenus of *Metasyrphus* Matsumura by some authors. Dr. W. W. Wirth has recommended that it be recognized as a full genus and that *Posthosyrphus* Enderlein be considered a valid subgenus under *Metasyrphus*. Fluke, in his catalogue of the Neotropical Syrphidae (1956:215), treats *Eupeodes* as a distinct genus. The name was misspelled in the Hawaiian literature "*Euplodes*" by Bryan (1934:414).

One species was introduced into Hawaii as an aphid predator.

Type of the genus: *Eupeodes volucris* Osten Sacken.

Eupeodes volucris Osten Sacken.

Eupeodes volucris Osten Sacken, 1877, Bull. U. S. Geol. Surv. 3:329.

Syrphus perpallidus Bigot, 1884, Ann. Soc. Ent. France, p. 90.

Not known to be established. This species was liberated along with other aphid-feeding syrphids by H. T. Osborn, in 1919, on the Hawaiian Sugar Planters' Association grounds, Honolulu (Osborn, 1920:333). It apparently did not become established. It has never been recovered in the field.

Western North America and Mexico.

This is an important aphid predator.

I have not seen this species. It apparently can be recognized by the characters given in the key above.

Genus **METASYRPHUS** Matsumura

Metasyrphus Matsumura, 1917, Ent. Mag. Japan (Kyoto) 2:147.

Similar in size and general appearance to *Syrphus* Fabricius but differing by having the sides of the abdomen emarginate, not curved downward; by the bare or pubescent metasternum; and by the bare squamae. Hull (1949:285) says "it is possible that *Metasyrphus* should be regarded as a subgenus of *Syrphus*." Dr. W. W. Wirth, U. S. Department of Agriculture, says, in correspondence, that no North American species fit in *Metasyrphus s. str.* as presently defined.

One species of *Metasyrphus* (*Posthosyrphus*) Enderlein was brought into Hawaii as an aphid predator. It is not known to be established.

Type of genus: *Syrphus corollae* Fabricius.

Subgenus **POSTHOSYRPHUS** Enderlein

Posthosyrphus Enderlein, 1937, S. B. Ges. Naturf. Fr. Berlin, p. 204.

This group was not recognized by Hull (1949:286) and I cannot be absolutely sure of its status. Dr. W. W. Wirth treats this as a subgenus of *Metasyrphus* Matsumura.

The original description of *Posthosyrphus* says that this group is characterized by having the eighth tergum of the male polished, smooth and narrow and shorter than the sixth tergum; with the seventh tergum being mostly hidden or only slightly protruded. The eyes are naked and the penis is extraordinarily long, conspicuous and longer than the eighth tergum. The genus *Syrphus* differs by having the penis shorter than the eighth tergum, mostly hidden or not visible. *Posthosyrphus* fits nearest to *Posthonia* Enderlein according to Enderlein but he did not indicate how the two are differentiated.

One species was introduced as an aphid predator but is not established.

Type of subgenus: *Syrphus wiedemanni* Johnson.

***Metasyrphus* (*Posthosyrphus*) *wiedemanni* (Johnson).**

Syrphus americanus Wiedemann, 1830, Ausser. Zweifl. Ins. 2:129. Preoccupied by *Musca* (*Syrphus*) *americana* Swederus, 1787, Kongl. Vetenskaps Acad. Nya. Handl. 8:4.

Syrphus wiedemanni Johnson, 1919, Can. Ent. 51:32.

Not known to be established in Hawaii.

North and Central America and northern South America. This species was imported into Hawaii from California and was liberated in 1919 as *Syrphus americanus* (Osborn, 1920:333). It evidently failed to become established.

This is an important aphid predator.

I have not seen this species. It is apparently differentiated by having a brown

stripe in the middle of the face, beginning at the epistoma but not reaching the antennae; by the presence of a brown spot above each antenna; by having the spots on the second abdominal tergum coalescent, rather than narrowly interrupted, and by the genital characters discussed under the subgenus.

The length was given as 9 to 10 mm. by Williston (1886:82).

Genus **SPHAEROPHORIA** Lepeletier and Serville

Sphaerophoria Lepeletier and Serville, 1825, Encycl. Meth., 10:513.

Small, slender flies with bright yellow markings on the male. Similar in most respects to *Mesograpta* Loew but with the male genitalia greatly enlarged and bulbous, about equal in width to the fifth abdominal segment.

The larvae are aphid feeders. For information on their habits and life histories refer to Metcalf (1912 and 1916) and Heiss (1938).

Genotype: *Musca scripta* Linnaeus.

Sphaerophoria sulphuripes (Thomson).

Syrphus sulphuripes Thomson, 1868, Kongl. Svenska. Freg. Eugenies Resa, p. 500.

Not known to be established. An adult specimen was reared from a larva found on celery in the local market; the celery probably had come in from California. The specimen was reared in Manoa Valley, Honolulu, January, 1950, by O. H. Swezey.

This species is distributed over the western United States. It is an important aphid predator on the West Coast. Davidson (1916:456) also reported the larvae preying upon the bean thrips.

The species should be readily recognized by its slender, straight-sided, chiefly rufous abdomen, and by the very large male genitalia.

Genus **SYRPHUS** Fabricius

Syrphus Fabricius, 1775, Systema Ent., p. 762.

This genus is not known to be established in the Hawaiian Islands, but one species has been reared from larvae found on vegetables brought in from California. There is a good likelihood that the genus will eventually become established in the islands. The members of this genus are characterized by the raised lateral margins of the abdomen, by having the head as broad at the antennae as above the oral margin (fig. 122a), by the submetallic gray pollinosity of the mesonotum, and by the black pilose front. These flies are brightly marked with

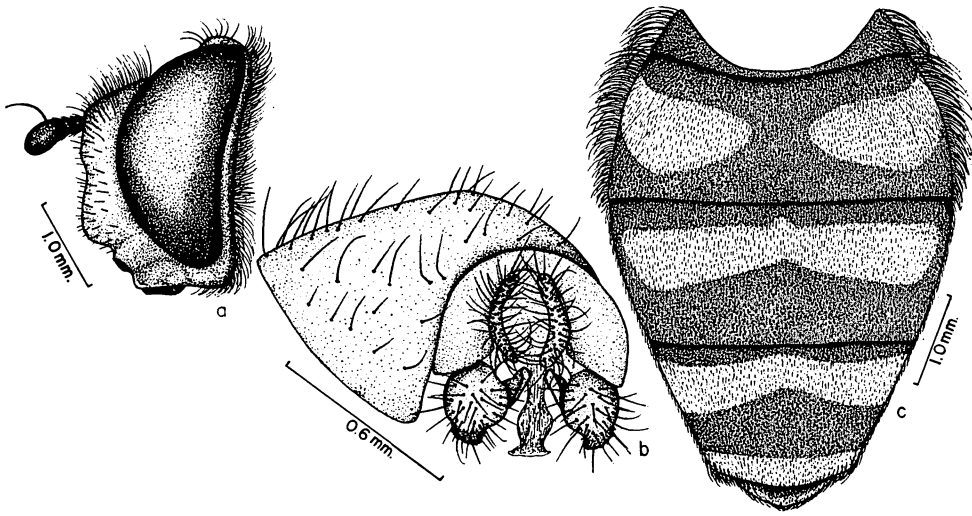


Figure 122—*Syrphus opinator* Osten Sacken: a, head, lateral; b, male genitalia, ventral; c, abdomen, dorsal.

bands of yellow or with paired yellow spots on the abdomen. The third antennal segment is oval and the face is greatly bulging below, with a low tubercle.

Genotype: *Musca ribesii* Linnaeus.

***Syrphus opinator* Osten Sacken (fig. 122a–c).**

Syrphus opinator Osten Sacken, 1878, Bull. U.S. Geol. Surv. 3:327.

Not known to be established in the Hawaiian Islands. This species has been reared from larvae found on celery in the local markets (probably from California) on at least two occasions: December 31, 1924 (O. H. Swezey), and April 23, 1950 (O. H. Swezey). Refer to Swezey (1926:220) for the first of these records.

This is an important aphid predator over the western United States and Mexico.

This species differs from other North American *Syrphus* by having the yellow bands on abdominal terga three and four complete and not reaching the side margins and, also, by having the front of both sexes predominantly yellow (refer to Fluke 1954:1). It is readily differentiated from any syrphids known from Hawaii by the shape of the head (fig. 122a), the black pilose front, the black mesonotum which is covered with metallic gray pollen, by the pattern of the markings on the abdomen (fig. 122c), as well as by the male genital characters (fig. 122b).

Length: body, 10.5–12.0 mm.; wings, 8.7–10.5 mm.

Genus **ISCHIODON** Sack

Ischiodon Sack, 1913, Ent. Mitt. 2:5.

These are medium-sized, *Syrphus*-like flies characterized by having bright yellow markings on the sides of the mesonotum, the front yellow pilose, the head broadest at the swollen portion above the epistoma (fig. 123e), and also by having a rather distinct ridge on the upper posterior margin of each mesopleuron.

This group has been treated as a subgenus of *Xanthogramma* Schiner and differentiated by having the costa ending well before the apex of the wing (fig. 123d). In recent correspondence, Dr. W. W. Wirth, Insect Identification and Parasite Introduction Research Branch, U.S. Department of Agriculture, stated that on the basis of the male genitalia, *Ischiodon* appears to be much closer to *Sphaerophoria* than to *Xanthogramma* and he thinks it best to consider it a full genus.

Only one species is present in Hawaii.

Type of genus: *Scaeva scutellaris* Fabricius.

Ischiodon grandicornis (Macquart) (fig. 123a-e).

Syrphus grandicornis Macquart, 1842, Dipt. Exot. 2 (2) :96.

Widespread throughout the islands although I have not seen specimens from Kauai and Lanai.

Immigrant. Widespread over the Pacific. First reported in Hawaii by Howard (1901:490) and Grimshaw (1901:19, pl. 2, fig. 7-10) as *Xanthogramma grandicornis* Macquart from specimens collected on Hawaii and Oahu in 1892. This is apparently the earliest record of this species in the Hawaiian Islands. The species has been commonly referred to in Hawaiian literature under the name *X. grandicornis* and also under *Simosyrphus grandicornis* (Macquart). Bezzi (1928:72) placed *grandicornis* as a synonym of *Ischiodon scutellaris* (Fabricius). This synonymy was accepted by Swezey (1929:282) and the name *scutellaris* has been used in the Hawaiian literature since that date. *Ischiodon* is a distinct species separated from *scutellaris* by having the apical third of the hind femur yellow, rather than black, and the humeri black, rather than yellow; as well as by other details. Dr. W. W. Wirth, U.S. National Museum, has confirmed that these are distinct species.

This is an important aphid predator and feeds on numerous different types of plant lice throughout the islands: refer to Swezey (1906:17); Kirkaldy (1907:100-101); Kotinsky (1907:77); Fullaway (1909:25); and Timberlake (1927:530).

This species is parasitized by *Diplazon laetatorius* (Fabricius), see Swezey (1929:282) and Perkins (1913: CLXXXIV). The adult parasites apparently oviposit in the eggs of the host. The eggs hatch together with the larvae of the parasite; the parasite grows to maturity along with the syrphid larva and the

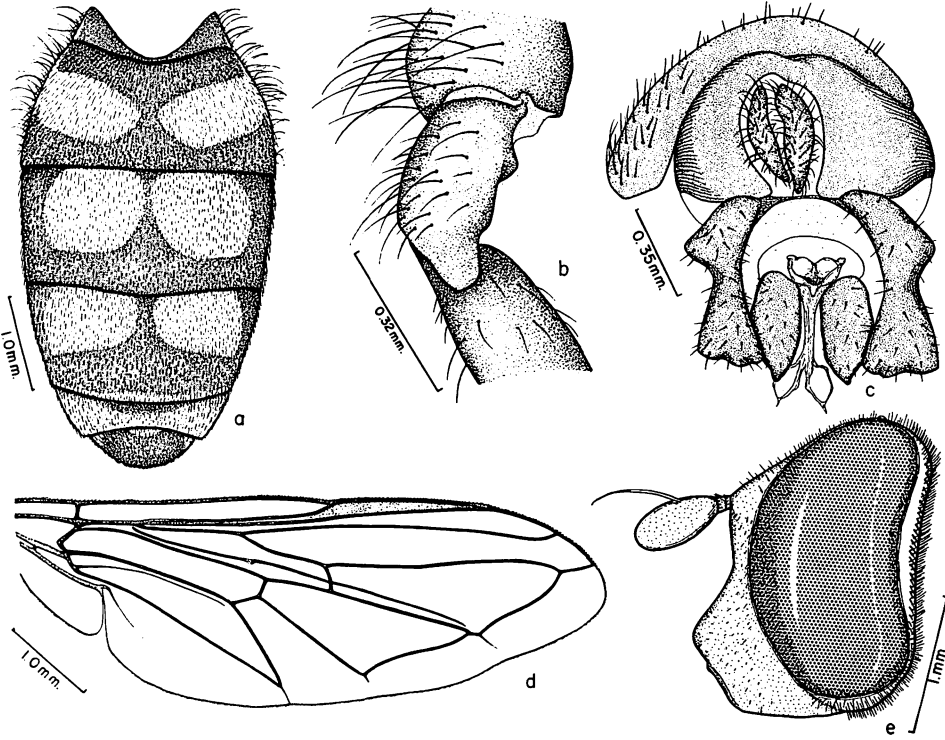


Figure 123—*Ischiodon grandicornis* (Macquart): a, abdomen, dorsal; b, hind trochanter; c, male genitalia, ventral; d, wing; e, head, lateral.

adult parasite emerges from the puparium of the host. It is also parasitized by *Pachyneuron allograptæ* Ashmead; see Timberlake (1918:403 and 1924:424).

See Williams (1931:289) for notes on the habits of *I. grandicornis*.

This species is characterized by the all-yellow front, face, genae, and scutellum, and by having the costa and the apex of vein R_{4+5} ending distinctly above the wing apex (fig. 123d). The head is shaped as in figure 123e. The thorax is densely yellow to gray pilose and shining black except for the yellow lateral margins of the mesonotum, the yellow scutellum, and upper portions of each mesopleuron. The hind trochanter is as in figure 123b. The markings on the abdomen are as in figure 123a; the black marking on the third tergum often divides the yellow marking into two spots. The male genitalia are as in figure 123c.

Length: body, 9.0–10.0 mm.; wings, 7.0–8.0 mm.

Tribe BACCHINI Bigot

Bacchidae Bigot, 1883, Ann. Soc. Ent. France, ser. 6, 3:231, 234.

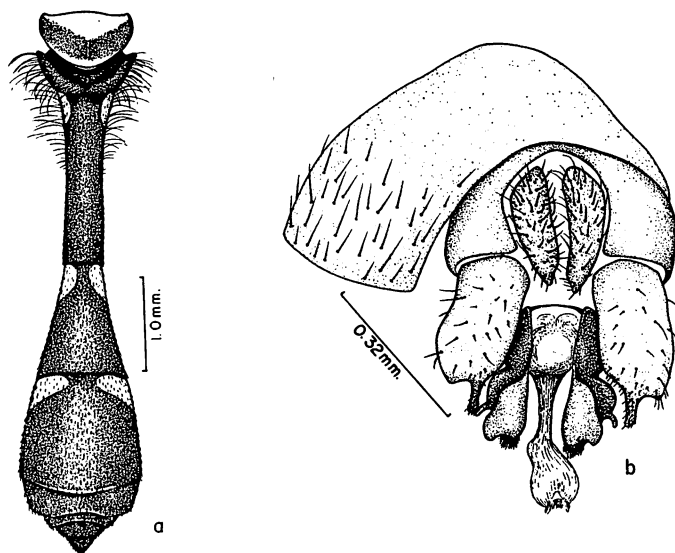


Figure 124—*Baccha clavata* (Fabricius): a, abdomen, dorsal; b, male genitalia, ventral.

Genus **BACCHA** Fabricius

Baccha Fabricius, 1805, Syst. Antl., p. 199.

For generic synonymy, refer to Fluke (1956:234).

This is a very large genus characterized by being slenderly built, usually with the abdomen petiolate (fig. 124a). The metasternum is bare and the face is usually tuberculate. This group is very well known because of its predaceous habits not only on plant lice but on various species of scale insects.

Type of genus: *Syrphus elongata* Fabricius.

One species has been liberated in Hawaii but is not known to be established.

Baccha clavata (Fabricius) (fig. 124a–b).

Syrphus clavatus Fabricius, 1794, Ent. Syst. 4:298.

For synonymy, refer to Fluke (1956:240).

This is the species which was introduced from Trinidad and released in Makiki, Honolulu, Oahu, on June 7, 1953, as an aphid predator under the name "*Baccha* sp." (refer to Weber, 1954:370). It is not known to be established.

Distributed over North and South America.

This species is differentiated from other New World *Baccha* which have the face and epistoma projected forward well beyond the bases of the antennae, by having the antennae close together at their bases; the face yellow with a broad, black vitta extending down the median portion; the scutellum bicolored, with

a transverse brown band over the median portion; and the abdomen clavate, predominantly black with the yellow markings as in figure 124a. The male genitalia are as in figure 124b.

Length of the specimens at hand: Male, body, 8.0 mm.; wings, 5.7 mm. (this specimen may be undersized). Females, body, 10.00–10.25 mm.; wings, 7.3–7.5 mm.

Tribe MELANOSTOMINI Williston

Melanostominae Williston, 1885, Bull. Brooklyn Ent. Soc. 7:131,133.

Genus MELANOSTOMA Schiner

Melanostoma Schiner, 1860, Wien. Ent. Monatschr. 4:213.

For synonymy, refer to Fluke (1957:7–8).

Members of this genus are characterized by having the face and scutellum aeneous or black; the face receding below and the epistoma not produced forward; the metasternum bare; and the abdomen not marginate.

Type of genus: *Musca mellinum* Linnaeus.

The members of this genus are probably all aphid predators; refer to Davidson (1922). Giard (1896) reported the larvae of one species feeding upon muscoid flies, and Chapman (1905) reared the larvae on caterpillars of *Philedone hyerana* (Mill) (as *Hastula hyerana*). He found that when deprived of aphids the larvae would eat caterpillars.

Melanostoma stegnum (Say).

Syrphus stegnus Say, 1829, Jour. Phila. Acad. Nat. Sci. 6:163.

For synonymy, refer to Fluke (1957:13).

Not known to be established in Hawaii. This species was intercepted in quarantine in 1921 on Chinese cabbage sent in from San Francisco (see Whitney, 1922:3).

Distribution: western United States and Mexico.

A predominantly dark-colored species apparently characterized by having the pollen on the face arranged in transverse ripple-like markings. The face and the front are metallic green. The basal segments of the antennae are predominantly black; the third segment is brown, tinged with rufous. The front is faintly gray pollinose and covered with erect, black pile. The thorax is metallic blue-green, covered with gray pile. The femora are metallic green; the tibiae are yellow-brown, darker toward the apices. The tarsi are black. The first segment of the hind tarsus is incrassate. The abdomen is black, with metallic green crossbands on the terga.

Length: 6.0–9.0 mm.

A specimen of *Melanostoma* sp. ? was reared by O. H. Swezey in Manoa Valley, Oahu, December 17, 1950, from a puparium found on celery which had been shipped in from California (see Hardy, 1952:459). This specimen was sent to Dr. F. M. Hull for identification, but no report has been received and the specimen has not been returned. It may probably have been *M. stegnum*.

Subfamily EUMERINAE Smirnov

Eumerinae Smirnov, 1924, Zool. Anz. 58:350.

The members of this subfamily are characterized by having the face recessive, lacking tubercles, and usually slightly convex; by the pilose metasternum; by the moderately recurrent apical crossvein which usually has a distal angle and a spur. Also the antennae are almost always short, the second and third segments are rarely elongated, and the eyes are usually pilose.

One genus occurs in Hawaii.

Genus EUMERUS Meigen

Eumerus Meigen, 1822, Syst. Besch. der Bekannt. Europ. Zweifl. Insekt. 3:202.
Citibaena Walker, 1857, Proc. Linn. Soc. Lond., 1:124.

Paragopsis Matsumura (1916:250) should replace *Eumerus* Meigen, 1822, which is a homonym of *Eumerus* Meigen, 1804, unless the Commission will rule *Eumerus* a *nomen conservandum*. Mr. J. E. Collin, New Market, England, has requested the International Commission to validate the name *Eumerus* (1822).

Curran (1934:501) considered *Eumerus* as a synonym of *Heliophilus* Meigen.

Moderately small syrphids with the body entirely metallic blue-black in ground color and with gray crossbands on the abdomen. The strongly convex and petiolate apex of cell R_5 (fig. 125c) will distinguish this from other Hawaiian syrphids.

Two species are known to be established in the Hawaiian Islands; a third species has been intercepted in quarantine.

Type of genus: *Eumerus strigatus* (Fallén).

Eumerus aurifrons (Wiedemann) (fig. 125a-e).

Pipiza aurifrons Wiedemann, 1824, Anal. Entomol., p. 32.

Distributed throughout the islands, although I have not seen a record from Molokai.

Immigrant. Oriental region and Southwest Pacific. First reported in Hawaii as *Eumerus* sp. ? in 1933 by Swezey (1934:361) and Pemberton (1934:375). It was reported as *Eumerus aurifrons* (Wiedemann) by Swezey (1937:366).

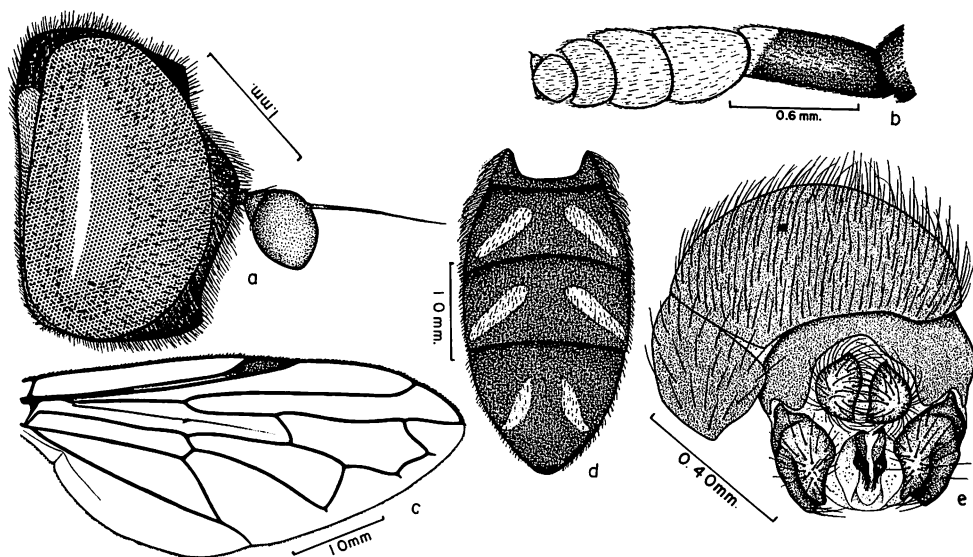


Figure 125—*Eumerus aurifrons* (Wiedemann) : a, head, lateral; b, hind tarsus of male; c, wing; d, abdomen, dorsal; e, male genitalia, ventral.

We have no information on the habits of this species in Hawaii. It is very probably a bulb feeder.

This species is readily differentiated from *E. marginatus* Grimshaw by the densely hairy eyes of both sexes; by the white apical segments of the tarsi—in the male these are strongly flattened and broad (fig. 125b); by the all-black scutellum; by having the eyes of the male separated on the front; by the yellowish colored antennae; as well as by the differences in the gray markings on the abdomen. For the pattern of the markings on the abdomen, refer to figure 125d. Refer to figure 125a for the shape of the head, to figure 125c for the wing venation, and to figure 125e for the male genitalia.

Length: body, 7.0–8.0 mm.; wings, 5.5–6.5 mm.

***Eumerus marginatus* Grimshaw (fig. 126a–b).**

Eumerus marginatus Grimshaw, 1902, Fauna Hawaiiensis 3 (2) :82.

Widespread throughout the islands, probably present on all of the main islands although I have seen specimens only from Hawaii, Oahu, and Kauai.

Immigrant. Asiatic and Southwest Pacific regions. This species was described from Hawaii (type locality: Honolulu) but is obviously not endemic. The earliest record is June, 1900.

This species has been found doing considerable damage to lily bulbs, especially *Narcissus*, and ginger on Hawaii and Oahu.

The type is in the British Museum (Natural History). I have examined the type and have designated homeotype specimens.

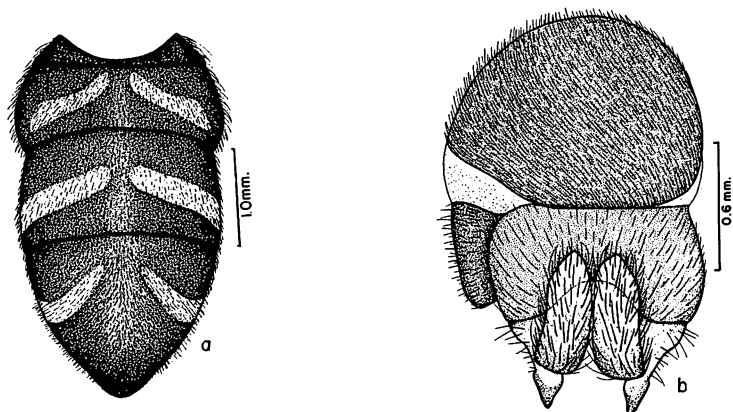


Figure 126—*Eumerus marginatus* Grimshaw: a, abdomen, dorsal; b, male genitalia, ventral.

This species differs from *E. aurifrons* by having the eyes bare in both sexes and holoptic in the males; by having the hind tarsi normal in size and shape and all yellow-brown; by the black antennae, and the scutellum with a yellow or white hind margin. For the markings of the abdomen refer to figure 126a and for the details of the male genitalia to figure 126b.

Length: body, 7.5–8.5 mm.; wings, 5.5–6.5 mm.

***Eumerus strigatus* (Fallén).**

Pipiza strigatus Fallén, 1817, Dipt. Svec., Syrphidae, Lundae: 61.

For the synonymy under this species, refer to Sack (1932:416). This species was bred by Whitney (1921:606) from daffodil bulbs imported from California in 1920.

Not known to be established.

Widespread over America, Europe, North Africa, and Asia Minor.

In American literature this species has been referred to as the onion bulb fly and as the lunate onion fly. Many others have indicated that this species is injurious to onions and possibly to *Narcissus* bulbs. Curran (1924:167) does not believe that the flies are primary invaders of onions and says that his "investigations would seem to indicate that this insect is a secondary pest and that it attacks only bulbs which have already begun to decay."

For notes on the habits and a description of this species, refer to Cole (1920) and Sack (1932:416).

This species is very similar in appearance to *E. marginatus*.

Smith (1928) indicates that *E. strigatus* is difficult to differentiate from other closely related species except by the male genital characters. The fifth sternum is deeply concave on the posterior margin, the concavity extends approximately two-thirds the length of the segment.

Length: 5.5–7.5 mm.

Subfamily VOLUCELLINAE Newman

Volucellites Newman, 1834, Ent. Mag. 2:379, 394.

The members of this subfamily in Hawaii are readily recognized by the plumose arista and by having the face strongly produced below (fig. 129a). Cell R_1 is usually closed and petiolate and the wing venation is as in figures 128a and 130b.

Only one genus and two subgenera are known from Hawaii.

The most up-to-date synopsis of the American species of *Volucella* is that by Curran (1939).

Genus VOLUCELLA Geoffroy

Volucella Geoffroy, 1762, Hist. Insect. Environs Paris 2:540.

For the synonymy under this genus, refer to Fluke (1957:57-58).

The members of this genus in Hawaii are recognized by the subfamily characters given above. The r-m crossvein is usually situated very near the base of cell 1st M_2 (fig. 128a).

Type of genus: *Musca pellucens* Linnaeus.

Subgenus ORNIDIA Lepeletier and Serville

Ornidia Lepeletier and Serville 1825, Encycl. Methodique 10:786.

These are brilliant metallic green or blue-green flies, distinguished from typical *Volucella* by the presence of a tuberculate swelling on each side of the median tubercle of the face (fig. 127a). Curran (1934:251 and 1947:1), and Fluke (1957:95) and other workers treat this as a distinct genus. Sack (1931:241) and others have placed it as a direct synonym of *Volucella* and Hull (1949:348) treats it as a subgenus of *Volucella*.

Type of subgenus: *Syrphus obesa* Fabricius.

Stone, *et al.* (1954:241), have pointed out that the generic names of Geoffroy should date to 1762; these have been commonly cited in the literature as 1764. Stone, *et al.*, *loc. cit.*: 245 also appealed to the International Commission for Zoological Nomenclature to validate the generic name *Volucella* Geoffroy and place it on the Official List of Generic Names in Zoology in order to protect this name from being invalidated because of the decision of the Paris Congress to substitute the word "binomial" for the word "binary" in the Code. This issue has been clarified in Article 11c, 1961 *International Code of Zoological Nomenclature*.

Volucella (Ornidia) obesa (Fabricius) (fig. 127a-b).

Syrphus obesa Fabricius, 1775, Syst. Ent., p. 763.

General in the lowlands on all of the islands.

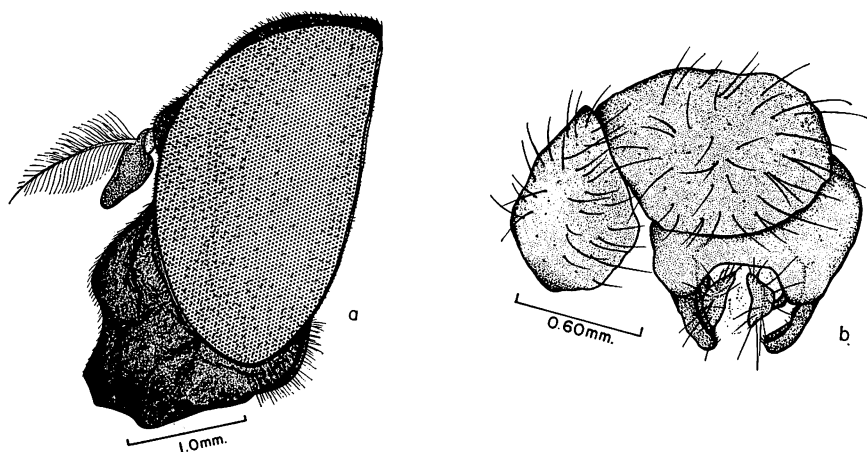


Figure 127—*Volucella (Ornidia) obesa* (Fabricius): a, head; b, male genitalia, ventral.

Immigrant. Widespread throughout the Neotropical zone, southern United States, and has been recorded from Fiji, Samoa, Tahiti, and the Marquesas.

This species was first reported in Hawaii by Grimshaw (1901:19). The earliest recorded specimens were taken on Kauai in 1894. The species is very common in the lowlands wherever fouled waters, mud, or decaying plant materials are available in which it can breed. Williams (1931:284) gave a brief account of its life history.

The adult is one of the most conspicuous of the Hawaiian Diptera. It is large and metallic green and is commonly seen hovering in the sunlight. The face is tri-tuberculate as shown in figure 127a. The wings are predominantly hyaline or subhyaline, each has a brown mark extending vertically across the middle of the wing from the costa at the end of the subcostal vein to vein M_{1+2} across the r-m crossvein; a small brown spot is also present at the junction of veins R_1 and R_{2+3} . Vein R_{2+3} is looped downward just before the junction with R_1 . Cell R_1 is closed and petiolate. The r-m crossvein is situated near the basal one-fifth or one-sixth of cell 1st M_2 . The male genitalia are as in figure 127b.

Length: body, 11.0–12.5 mm.; wings, 10.5–11.0 mm.

Subgenus **PHALACROMYIA** Rondani

Phalacromyia Rondani, 1848, Baudi and Truqui Studi Ent. 1:67.

Members of this subgenus are differentiated from typical *Volucella* by the preapical concavity on the surface of the scutellum, by the black bristles along the sides of the mesonotum, and by having cell R_1 usually open.

Fluke (1957:57), and other workers, have treated this as a synonym of *Volucella*. Hull (1949:348) treats it as a subgenus.

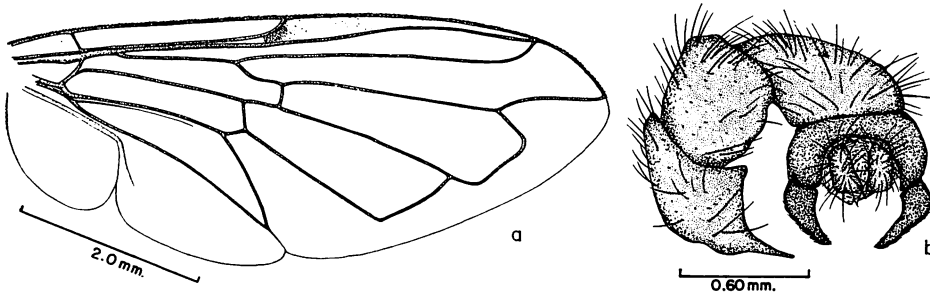


Figure 128—*Volucella (Phalacromyia) dracaena* Curran: a, wing; b, male genitalia, ventral.

Type of subgenus: *Phalacromyia submetallica* Rondani.

Two Hawaiian species fit in this subgenus.

***Volucella (Phalacromyia) dracaena* Curran (fig. 128a–b).**

Volucella dracaena Curran, 1947, Amer. Mus. Novit. 1361:2.

Volucella sp. ? Hardy, 1952, Proc. Haw. Ent. Soc. 14 (3) :460.

Known only from Oahu (type locality: Honolulu) and Hawaii; it may possibly be on the other main islands.

Very probably an immigrant from Central America, although it is presently known only from the Hawaiian Islands. Dr. W. W. Wirth, U.S. Department of Agriculture has reported *in litt.* that he has found one specimen in the National Museum collection from Costa Rica which he has provisionally identified as *dracaena*.

The larvae are scavengers; specimens have been reared from rotting *Opuntia* pads. The adults have been collected on the flowers of *Dracaena* and *Hoya*. The earliest record I have seen for this species is 1946.

This species appears to be quite variable in coloration and the specimens which I referred to as species? (Hardy, 1952:460) were melanistic representatives of this species. The color is typically reddish yellow to yellow-brown, tinged with violet or purple, especially on the mesonotum. The dark-colored specimens mentioned above are predominantly submetallic blue-black and the legs are predominantly dark colored. *V. dracaena* is differentiated from *tricincta* Bigot by having rather weak lateral depressions on the scutellum, by having the femora rufous or brownish red, and the sternopleura and lower portions of pteropleura rufous or brownish red. Also, the male genitalia are strikingly different in the two species (figs. 128b and 129b). Cell R_1 is rather variable; it apparently is typically open in this species but is sometimes barely closed (fig. 128a) and occasionally has a short petiole. The male genitalia are small and inconspicuous. The claspers are not readily visible *in situ*. From a ventral view the genitalia are as in figure 128b.

Length: body, 7.5–8.5 mm.; wings, 7.4–7.7 mm.

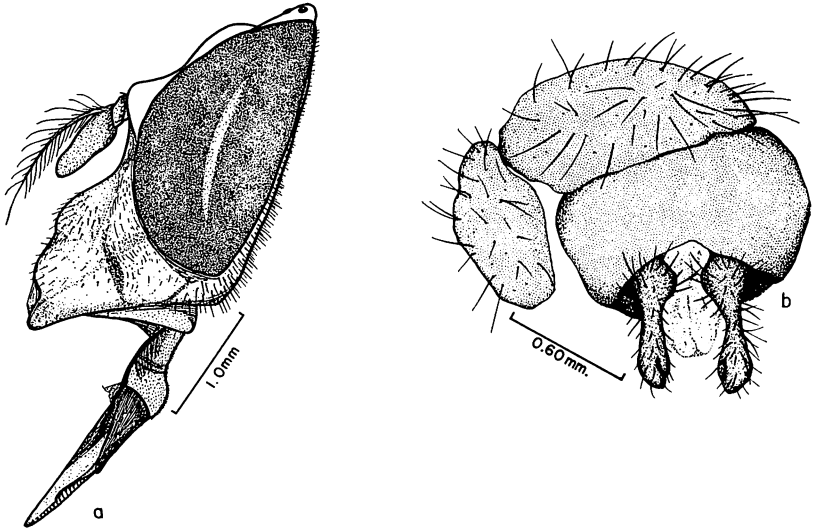


Figure 129—*Volucella* (*Phalacromyia*) *tricincta* Bigot: a, head; b, male genitalia, ventral.

***Volucella* (*Phalacromyia*) *tricincta* Bigot (fig. 129a–b).**

Volucella tricineta Bigot, 1875, Ann. Soc. Ent. France:477.

Volucella hoya Curran, 1947, Amer. Mus. Novit. 1361:1. **New Synonym** (Wirth *in litt.*).

Oahu (type locality: Honolulu), Maui, Kauai; probably on all of the main islands.

Immigrant. Mexico, Central America, and Texas. *V. hoya* was described from Hawaii.

This species is recognized by its chiefly yellowish thorax with three rather faint brown longitudinal vittae extending down the mesonotum and with the sternopleura and lower portions of the pteropleura shining black. The scutellum has three large depressed areas; the lateral depressions are approximately as long as wide. The femora are yellow except for their shining black bases; the frontal triangle of the male is yellow, sometimes tinged slightly with brown. The male genitalia are conspicuous *in situ*; from a ventral view they are as in figure 129b; the cerci are apparently absent. The head is shown in figure 129a.

Length: body, 6.5–8.5 mm.; wings, 6.0–7.5 mm.

This species has been reared from rotting tomatoes and avocados. The earliest collection record seems to be 1946.

Subgenus VOLUCELLA Geoffroy

Members of the typical subgenus are differentiated from *Phalacramyia* by

having no depressions on the scutellum and no black bristles on the sides of the mesonotum. Cell R_1 is closed and petiolate.

Only one species occurs in Hawaii.

***Volucella tamaulipana* Townsend** (fig. 130a-c).

Volucella tamaulipana Townsend, 1898, Journ. N. Y. Ent. Soc. 6:51.

Volucella timberlakei Curran, 1926, Ann. Ent. Soc. Amer. 19:63, New synonym (Wirth in litt.).

Volucella feminina Curran, 1930, Amer. Mus. Novit. 416:4, New synonym (Wirth in litt.).

Common in the lowlands on all of the main islands; specimens have not been seen from Lanai.

Immigrant. Southern Texas and Mexico.

Type in the Canadian National Collection, Ottawa.

This species has been treated commonly in the Hawaiian literature under the name *Volucella pusilla* Macquart. It was first reported in Hawaii by O. H. Swezey in 1930 (Swezey, 1931:393).

Dr. J. R. Vockeroth, Canada Department of Agriculture, Ottawa, recently had occasion to compare specimens of the Hawaiian "*pusilla*" with *pusilla* specimens from Florida and found them to be distinctly different. He reported back to me that our specimens agree well with a female from Jalisco, Mexico, which is identified as *feminina* Curran and that they also agree well with specimens of *timmerlakei* Curran (synonym of *tamaulipana* Townsend), from southern Texas and Mexico. Dr. Vockeroth kindly loaned me these specimens, including topotypes of *timmerlakei*, for comparison with Hawaiian specimens. I have also examined four specimens of *timmerlakei*, including one paratype, from the American Museum (loaned by Paul Arnaud). Our specimens agree in all respects with those of *timmerlakei* and are without doubt that species. *V. pusilla* Macquart, based upon specimens in the Canadian National Museum from Florida, differs from our species by having a pair of rather widely separated prescutellar yellow spots; the face with a polished black vitta down the middle; the legs shining black, except for the yellow basal two segments of each tarsus, and narrowly yellow apices of femora and bases of tibiae; the abdominal markings distinctly different, the third tergum with a black eye-like spot in the middle of the yellow area on each side, and the fourth and fifth terga black except for a narrow border of yellow at base of the fourth. Also by having the upper half of each mesopleuron bright yellow.

I have studied specimens determined as *feminina* Curran from the American Museum collection and found them to be the same as *tamaulipana*. Dr. W. W. Wirth has confirmed this synonymy.

V. tamaulipana is readily separated from other Hawaiian *Volucella* by the transverse brown bands across the wings (fig. 130b); by the broad median and lateral stripes on the face (fig. 130a); and by having the pleura black except for the yellow propleura. The male genitalia are as in figure 130c.

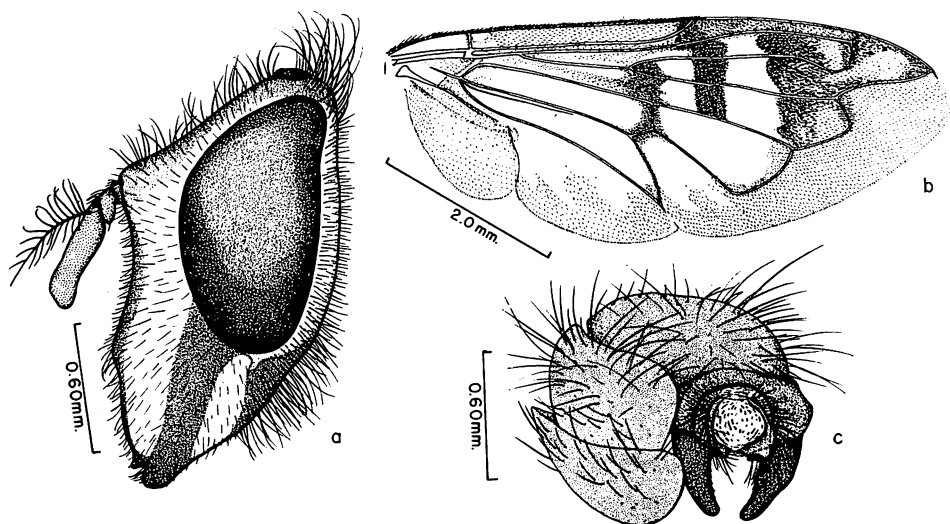


Figure 130—*Volucella tamaulipana* Townsend: a, head; b, wing; c, male genitalia, ventral.

Length: body, 7.0–9.0 mm.; wings, 7.7 mm.

This is the most common species of *Volucella* with the possible exception of *obesa* (Fabricius). It apparently breeds in a wide assortment of decaying plant materials. It breeds in great numbers in rotting cactus pads (Swezey, 1932:28) which have been attacked by the cactus moth, *Cactoblastis cactorum* Berg, plus rot.

Subfamily XYLOTINAE Bigot

Xylotinae Bigot, 1883, Ann. Soc. Ent. France, ser. 6, 3:231, 244.

This group fits near the Eristalinae, but according to Hull's classification members differ by lacking the basal patches of black setae on the hind femora; by the r-m crossvein being almost always at or beyond the middle of cell 1st M²; by the hind tibia often having a distinct keel or "knife edge" along the under-side at basal third of the segment; and by lacking the downward loop on vein R₄₊₅.

The group is readily recognized in Hawaii since the only genus, *Syritta*, is so characteristic.

Genus SYRITTA Lepeletier and Serville

Syritta Lepeletier and Serville, 1825, Encyl. Method. 10:888.

For synonymy under *Syritta*, refer to Sack, 1932:369.

The members of this genus are easily recognized by the very strongly swollen hind femora armed with teeth ventrally (fig. 132b), by the long, narrow straight-sided abdomen (fig. 131a), and by the pilose humeri.

Three species are known to occur in the Hawaiian Islands.

Type of genus: *Musca pipiens* Linnaeus.

The larvae are scavengers living in various types of rotting organic matter. The adults are found commonly around flowers and on vegetation.

Syritta aenigmatopatria, new species (fig. 131a-d).

I am unable to find this species in the literature and presume it to be undescribed. R. L. Coe, British Museum (Natural History), has kindly studied this species for me and determined it as "sp. nov. near *orientalis* Macq."

The species is obviously an immigrant to Hawaii and probably came to the islands from some place in the Pacific. The species name comes from the Latin *aenigmatis* (something obscure, riddle or mystery) plus *patria* (fatherland or native country).

This species has not previously been recorded in the Hawaiian literature and has obviously been confused with *S. orientalis* Macquart and possible *oceanica* Macquart. The oldest records I have found in collections is 1950; it may be a rather recent introduction. It appears most closely related to *S. orientalis* but differs in many respects. The male genitalia are strikingly different as seen in figures 131d and 133b. The hind femora are entirely black, and are shaped much as those of *orientalis* except that the ventral spines are differently arranged. In the male a slightly raised area is situated just before the base on the anteroventral surface; this bears three or four short, black teeth (fig. 131b). The hind tibia of the male differs from that of *orientalis* by having a raised area in the middle on the ventral surface. The face is completely yellow rather than having the upper portion of the face typically brown in ground color. The second and third abdominal terga of the male each has a broad band of yellow which is sometimes slightly interrupted medianly by a reddish or brownish discoloration. In *orientalis* a narrow black line usually separates the yellow marks on terga two and three. In *aenigmatopatria* the fourth tergum of the male is black, often tinged with reddish brown and with a faint bluish sheen as seen in direct light, the apical band of yellow is rather broad, one-half to two-thirds as wide as the brown band across the third tergum (fig. 131a). In *orientalis* only the extreme apex of the fourth tergum is yellow; this band is less than one-fourth as wide as the brown band on the third tergum.

MALE. Head: The face and lower front are entirely yellow, rather densely covered with silvery gray pubescence. The antennae are yellow. The face is straight or nearly so in profile. The junction of the compound eyes is about equal in length to the pollinose portion of the upper front. **Thorax:** The pleura are densely silvery gray pollinose, completely obscuring the ground color. The ground color is brown to black, tinged with rufous. The mesonotum is shining black except for a strip of yellow-brown extending on each side from the humerus

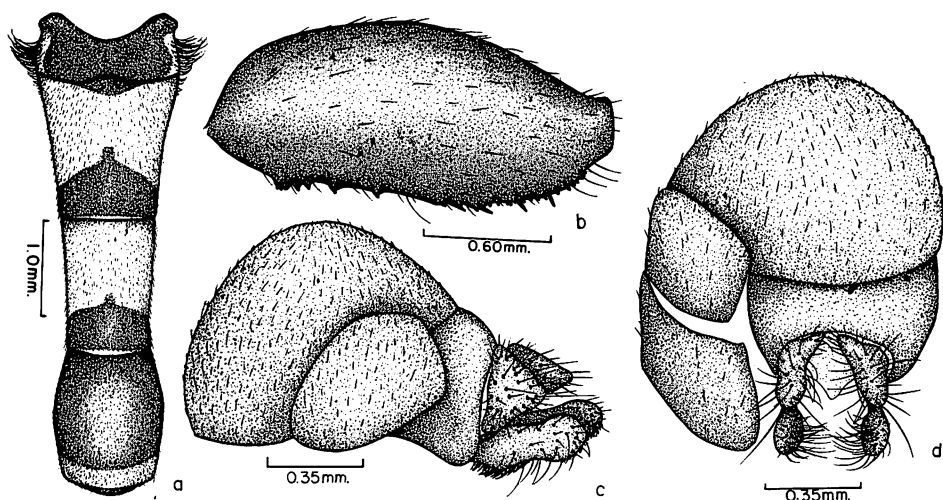


Figure 131—*Syritta aenigmatopatria* n. sp.: a, abdomen, dorsal; b, hind femur; c, male genitalia, lateral; d, male genitalia, ventral.

to the suture. Except for the area on each side above the wing base the entire margin of the mesonotum is narrowly gray pollinose. The humeri are yellow, covered with silvery gray pollen. The halteres are pale yellow. *Legs*: The coxae are brown to black covered with gray pollen; the front and middle legs are otherwise yellow except for discolorations of brown to black at the bases of the femora. The hind femora are black, the arrangement of the ventral spines is as in figure 131b. The hind tibiae are predominantly brown with a broad yellow band around the middle. The posteroventral edge of the hind tibia is carinate (this is especially pronounced near the middle of the segment). *Wings*: I see no features in the wing venation which would differ from other *Syritta*. *Abdomen*: The first tergum is predominantly opaque brown to black, yellow on the sides. The second and third terga are chiefly yellow; each has a rather broad dark brown to black band over the apical one-third to one-fourth of the segment and the second has a narrow strip of black across the base adjoining the black marking on the first tergum. The second tergum also has a faint indication of a longitudinal median vitta on typical specimens and in some specimens at least the posterior portion of the median vitta is faintly indicated. The fourth tergum is predominantly shining black with a faintly bluish sheen; the apical one-sixth of the segment is yellow. The male genitalia are as in figures 131c and 131d. The ninth segment is gently concave posteriorly; the cerci are large, rather triangular in shape; and the claspers are straight-sided, slightly enlarged apically and densely setose basally and apically.

Length: body, 8.0–9.0 mm.; wings, 5.3–5.8 mm.

FEMALE. The females of this species are not clearly defined to date; too few specimens have been seen and none has actually been associated with the males

in the field. The specimens which apparently belong here are very similar to the females of *orientalis* but seem to differ by having a broader band of yellow at the apex of the fourth abdominal tergum, as in the male, rather than a very narrow band of yellow, as found in *orientalis*. Also the face is all yellow, whereas in *orientalis* the upper portion of the face is usually brown. When placed side by side the specimens of *aenigmatopatria* seem consistently larger than those of *orientalis*. This difference is rather slight, however, and is probably of no significance. The ventral spines of the hind femora are somewhat irregular with about four spines in a row, plus two to four spines more widely spaced over the basal half of the segment.

Length: body, 8.50–9.25 mm.; wings, 5.70–6.00 mm.

Holotype male: Pupukea, Oahu, April, 1952 (M. S. Adachi). Nine paratypes (all males) from the following localities on Oahu: Poamoho Trail, May, 1953 (D. E. Hardy); Kalihi, Honolulu, September, 1958 (A. Suehiro); John Rodgers Airport, May, 1958, light trap (E. J. Ford, Jr.); Honolulu, May, 1950, January, 1957, and May, 1959 (P. W. Weber, W. H. Watanabe, and D. E. Hardy); Pauoa Flats, May, 1956 (D. E. Hardy); Maunawili, February, 1953 (D. E. Hardy); and same locality as type, March, 1952 (D. E. Hardy).

Five females, which apparently belong here, are on hand; they are not being designated as paratypes, however, and an allotype has not been selected. Four are from two or more districts of Honolulu collected from January through November, 1951–1954 (O. H. Swezey, N. Tanaka, and D. E. Hardy). One specimen is from Kahuaawi Gulch, Molokai, July, 1952 (D. E. Hardy).

The type and one paratype are in the Bernice P. Bishop Museum collection. The remainder of the specimens are in the following collections: United States National Museum; British Museum (Natural History); Hawaiian Sugar Planters' Association; and the University of Hawaii.

Syritta oceanica Macquart (fig. 132a–c).

Syritta oceanica Macquart, 1854, Dipt. Exot., Suppl. 5:112.

Widespread throughout the lowlands of all of the islands although I have not seen specimens from Lanai.

Immigrant. This species is probably widespread over the Pacific region. Hull (1937:84) listed the distribution as New Zealand, Tahiti, and the Marquesas Islands. The original description gave the distribution as "De l'oceanie, Otaiti et Nouvelle Zealande." Bigot repeated the records for Tahiti and New Zealand (see Miller, 1921:313). Hutton (1881) did not believe that it occurred in New Zealand but Hull (*loc. cit.*) says it has been recorded from there since. He also said "possibly the 'Taita' of New Zealand has been confused with Tahiti." Miller (1950:143) lists it with the species which had previously been recorded from New Zealand but where there is some doubt as to the accuracy of the records. He says "it is possible that the species does occur in New Zealand and has not yet been recognized." Bezzi (1928:82) has recorded this from Fiji and it

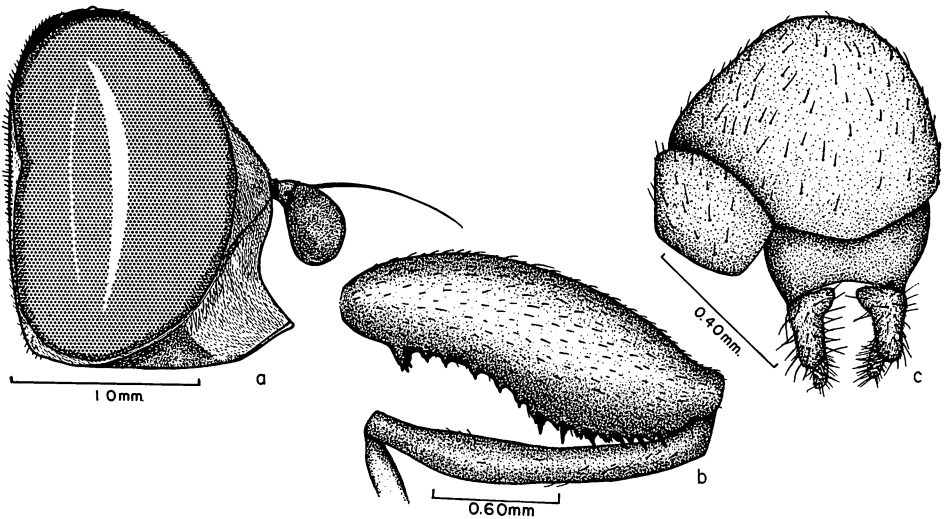


Figure 132—*Syritta oceanica* Macquart: a, head; b, hind leg; c, male genitalia, ventral.

is probably included in Shiraki's concept of *S. orientalis* (1963:159) from Micronesia and possibly other areas.

This species was first recorded in Hawaii by Howard (1901:490) and Grimshaw (1901:19). The larvae are apparently scavengers, living in decaying organic matter. The life history has been worked out, and the immature stages have been figured by Terry (1910:96). The adults are common on vegetation, especially on Compositae.

This species is distinguished from *S. orientalis* Macquart by having the front and middle femora and lower portion of face black; the fuscous to black third antennal segment; the black ground color of the humeri; polished black fourth abdominal tergum of the male; the concave face (fig. 132a); the less enlarged and differently ornamented hind femora (fig. 132b); the differences in the male genitalia (fig. 132c); and by the shorter junction of the compound eyes in the male (the length of the approximation of the eyes is slightly greater than the length of the lower portion of the front). The hind femora are polished black, more distinctly swollen on the apical half, and with a moderately large ventral tubercle near the base which bears two to three teeth at its apex (fig. 132b). The yellow markings on the second and third abdominal terga are divided into two lateral spots by a broad, black stripe down the median portion of each segment. The fourth tergum is entirely polished black except for the basal corners which are gray pollinose. The male genitalia are as in figure 132c.

Length: body, 9.25–9.75 mm.; wings, 5.5–6.0 mm.

***Syritta orientalis* Macquart (fig. 133a–b).**

Syritta orientalis Macquart, 1842, Dipt. Exot. 2 (2) :76.

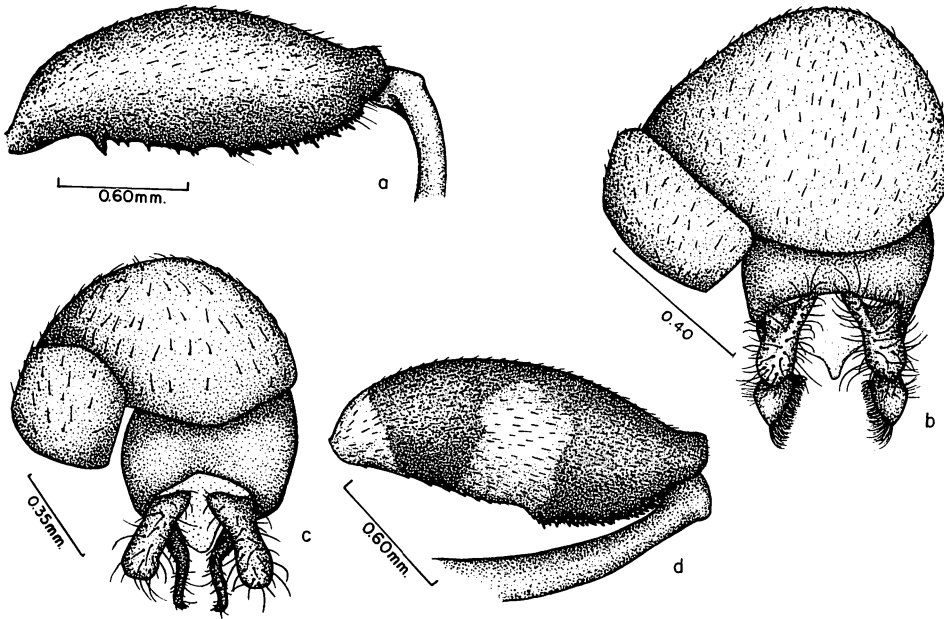


Figure 133—*Syrphid orientalis* Macquart: a, hind femur; b, male genitalia, ventral. *S. pipiens* (Linnaeus): c, male genitalia, ventral; d, hind femur.

For synonymy, refer to Shiraki (1963:159). I cannot confirm this synonymy, however, and do not agree that *oceanica* Macquart is a synonym.

Probably present on all of the main islands although I have not seen specimens from Maui, Molokai, or Lanai.

Immigrant. Widespread throughout the Oriental and Pacific regions.

First reported in Hawaii by Weber (1949:332) from a specimen taken at Punaluu, Oahu, October, 1946. This species is now the most abundant of the *Syrphid* in many parts of the islands.

S. orientalis differs from *oceanica* by having the front and middle femora, lower portion of face, third antennal segment, and the ground color of the humeri yellow; by having the face nearly straight; the hind femora more strongly swollen and differently armed (fig. 133a); the fourth tergum of the male metallic blue; the approximation of the compound eyes of the male about equal in length to the pollinose portion of the front; and the female front with a pair of gray spots at about the upper one-fourth. The male genitalia are distinctly different as shown in figure 133b. The antennae are clear yellow. The hind femora are dark brown to black dorsally, tinged with rufous on the sides and ventral surfaces. Each hind femur has a small sub-basal tubercle on the postero-ventral surface; this has a single tooth at its apex (fig. 133a). In the male the yellow markings on the second and third terga are sometimes united in the

median portion; typically, however, they are separated by a thin, black stripe down the median line.

Length of male: body, 7.4–7.7 mm.; wings, 4.6–5.0 mm. Length of female: body, 7.4–8.5 mm.; wings, 4.6–5.7 mm.

S. orientalis appears to fit fairly near *pipiens* (Linnaeus) but differs by having the fourth tergum of the male shining blue-black; the male genitalia are very different as shown in figures 133b and 133c; the hind femur lacks the incomplete rufous band in the median portion which is characteristic of *pipiens* (fig. 133d); and the abdominal spots on the second and third terga of the male are united or separated by narrow, often incomplete, black lines, rather than separated by broad, median stripes.

Subfamily ERISTALINAE Newman

Eristalites Newman, 1834, Ent. Mag. 2:379, 394.

The members of this subfamily are characterized by having vein R_{4+5} curved downward strongly into cell R_5 (fig. 135b), and by having a patch of black setulae situated on the bases of all femora; these are especially distinct on the hind pair.

Tribe ERISTALINI

Eristalites Newman, 1834, Ent. Mag. 2:379, 394.

The members of this tribe are characterized by having cell R_1 closed and petiolate (fig. 135b). These are almost always short-pilose flies.

Genus ERISTALIS Latreille

Tubifera Meigen, 1800, Nouv. Class. Mouch., p. 34. A rejected name.

Eristalis Latreille, 1804, Hist. Nat. Crust. Ins. 14:363. For synonymy under this genus, refer to Fluke (1957:128–129).

Sack (1931:278) lists *Tubifera* Meigen (*s. str.*) as a genus distinct from *Eristalis* Latreille and lists *Helophilus* Meigen, *Elophilus* Meigen, and *Anasimyia* Schiner as synonyms under *Tubifera*.

The members of this genus are readily recognized by the distinctive wing venation: the strongly down-curved vein R_{4+5} and the closed cell R_1 (fig. 135b). The eyes are densely pilose in the typical subgenus.

Type of genus: *Musca arbustorum* Linnaeus.

Subgenus ERISTALOMYIA Rondani

Eristalomyia Rondani, 1857, Dipt. Ital. Prodrôme 2:38.

Members of this subgenus are characterized by having the arista bare or with microscopic pubescence. These flies are comparatively large, bee-like in appearance. Sack (1931:262) treats this as a distinct genus.

Type of subgenus: *Musca tenax* Linnaeus.

Eristalis (Eristalomyia) tenax (Linnaeus) (fig. 134a).

Musca tenax Linnaeus 1758, Syst. Natur., p. 591.

For synonymy, refer to Fluke (1957:144) and Sack (1931:266).

Widespread over the islands at higher elevations; I have not seen records from Molokai and Kauai.

Immigrant. Widespread throughout the temperate and subtropical areas of the world. This was first recorded in Hawaii by Howard (1901:490) and by Grimshaw (1901:19) from specimens taken on Hawaii in 1892. It appears to be confined almost entirely to the higher elevations, the more temperate areas, of the islands.

This is the common drone fly of much of the world. Verrall (1901:674) said "*Eristalis tenax* is essentially the 'drain fly' of the whole world, as it has followed all over the world what civilization has considered its improved sanitary arrangements of drainage." The rat-tail maggots are found in great abundance in aquatic situations rich in decaying organic matter. The breather tube is extrusible for a length of two to three inches. The eggs are laid in masses near stagnant water and other liquid filth.

This species is readily distinguished from all other Hawaiian Diptera by its honeybee-like appearance; the layman often mistakes these flies for honeybees. The head, thorax, and body are black. The legs are predominantly so, yellow on the bases of the front and middle tibiae. The entire body is rather densely yellow pilose with some intermixed black pile on the front, the ocellar triangle, on the under portion of the hind tibiae, and the under apical portion of the hind femora. The pile of the eyes is arranged in two vertical stripes, and the posterior and anterior margins of the eyes are sparsely pilose. The legs are predominantly black; the bases of the front and middle tibiae are yellow. A large yellow spot is present on each side of the second and third terga. The fourth tergum and the genitalia are shining black. The male genitalia are as in figure 134a.

Length: body, 15.0–16.5 mm.; wings, 11.8–12.5 mm.

Subgenus **LATHYROPHTHALMUS** Scopoli

Lathyrophthalmus Scopoli, 1894, Wien. Ent. Ztg. 14:114.

Members of this subgenus are differentiated from other *Eristalis* by the presence of numerous small dark spots on the eyes (figs. 134c and 135a). The eyes are bare or nearly so in the Hawaiian species. Shiraki (1963:168) treats this as a genus.

Type of subgenus: *Conops aeneus* Scopoli.

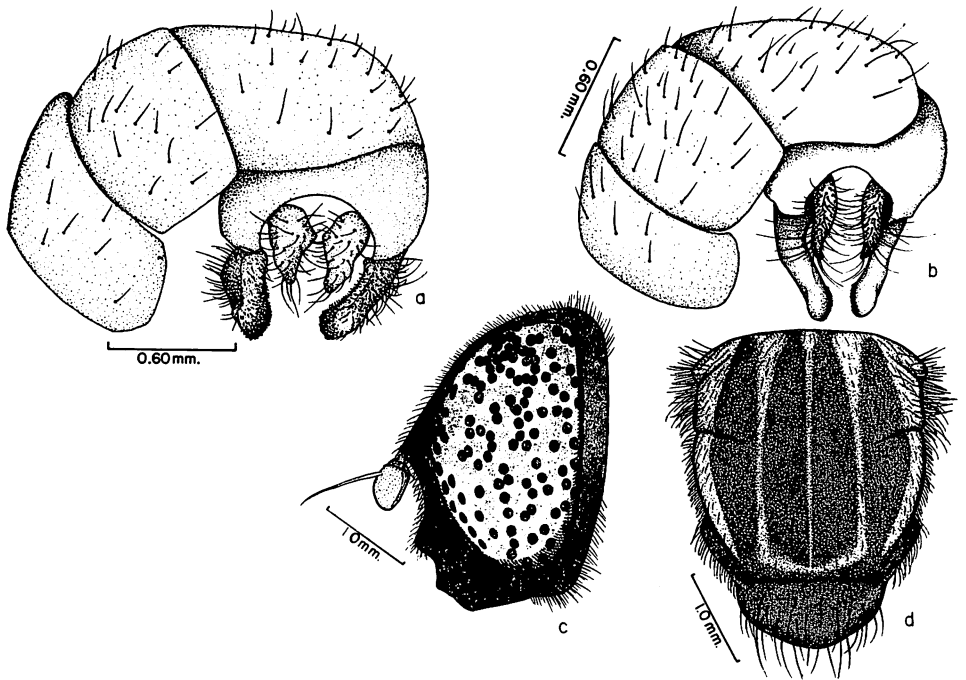


Figure 134—*Eristalis* (*Eristalomyia*) *tenax* (Linnaeus) : a, male genitalia, ventral. *E.* (*Lathyrrophthalmus*) *aeneus* (Scopoli) : b, male genitalia, ventral; c, head, lateral; d, thorax, dorsal.

***Eristalis* (*Lathyrrophthalmus*) *aeneus* (Scopoli) (fig. 134b-d).**

Conops aeneus Scopoli, 1763, Ent. Carn., p. 356.

For synonymy under this species, refer to Sack (1931:269) and to Shiraki (1963:176).

This species is probably widespread throughout the Hawaiian Islands although I have seen specimens only from Oahu, Molokai, and Niihau islands.

Immigrant. Widespread over the Palearctic and Nearctic regions, North Africa, the Middle East, and Micronesia.

This species was first reported in Hawaii in 1919 by Osborn (1920:339). It was thought to have immigrated here from the Pacific Coast of the United States about 1918 or 1919.

This species breeds in decaying organic matter. Little or nothing is known about its immature stages here in Hawaii, but its life history has been worked out on the mainland of the United States by Metcalf (1913:84-89, pl. 4, figs. 149-150 and pl. 5, figs. 145-148). He observed the larvae living in sewage. Illingworth (1923:280) found it attracted to carrion in Hawaii.

This species is easily differentiated from the other *Lathyrrophthalmus* in Hawaii by its predominantly greenish black coloration. The spotting of the eyes and the head shape are as in figure 134c. The pattern of gray vittae on the

mesonotum is as in figure 134d. The body is rather densely covered with yellow pile and the abdomen is entirely metallic black. The genitalia are as in figure 134b.

Length: body, 11.0–12.0 mm.; wings, 8.0–9.0 mm.

***Eristalis (Lathyrophthalmus) arvorum* (Fabricius)** (fig. 135a–d).

Syrphus arvorum Fabricius, 1787, Mant. Insect., Hafniae 2:335.

For synonymy under this species, refer to Sack (1931:270) and to Shiraki (1963:175).

This species is generally distributed throughout the islands although I have not seen records from Kauai.

Immigrant. Widely distributed throughout central, eastern, and southern Asia, and the Pacific. It was first recorded in Hawaii in 1900 as *Eristalis punctulatus* Macquart from specimens taken at Honolulu by Grimshaw (1902:82). This was apparently an error for *E. arvorum*.

The larvae are aquatic, living in water fouled by decaying plant or animal matter. They breed in tremendous numbers in filter-press mud around the sugar-cane factories and in pineapple and sisal refuse. The larva has a long

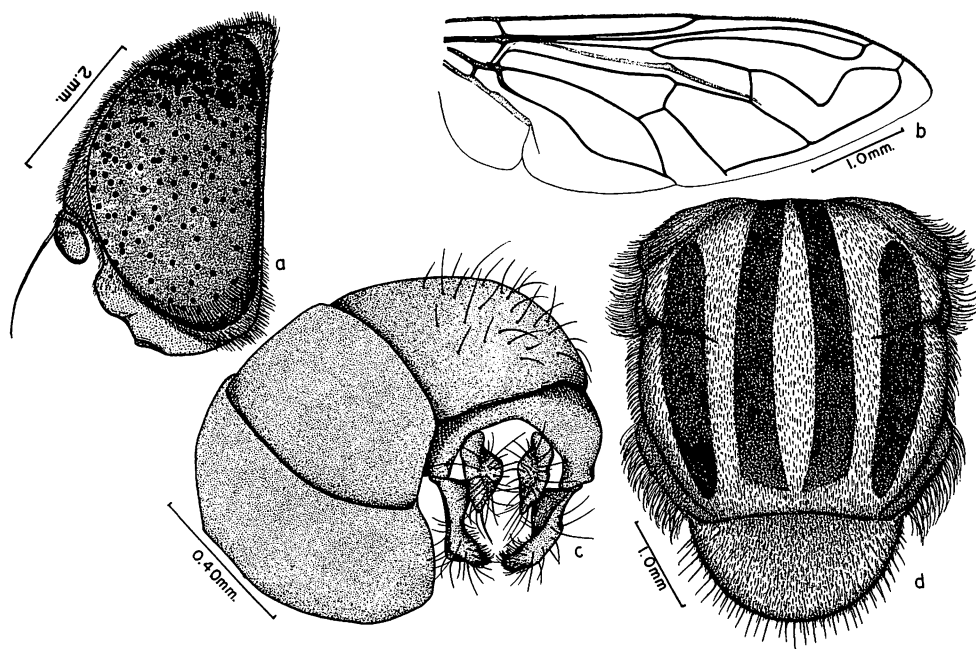


Figure 135—*Eristalis (Lathyrophthalmus) arvorum* (Fabricius): a, head, lateral; b, wing; c, male genitalia, ventral; d, thorax, dorsal.

protusile breathing tube which can be extruded nearly two inches. The adults are found feeding on the nectar and pollen of flowers and around stagnant pools or puddles which are attractive for oviposition. Williams (1938:285–288, figs. 5–11) has worked out the biology and has figured all of the stages. Williams (1933:233) reported an ichneumonid wasp (*Phygadeuon* sp. ?) as being parasitic in the puparia of this fly.

This species is readily distinguished from *E. aeneus* by the predominantly yellowish thorax with four shining black vittae extending longitudinally down the mesonotum (fig. 128d). The rufous legs and the yellow cinereous crossbands on the abdominal terga are also distinctive. For the spotting of the eyes and the shape of the head, refer to figure 135a, for the wing venation to figure 135b, for the markings on the mesonotum to figure 135d, and for the male genitalia to figure 135c.

Length: body, 11.0–14.0 mm.; wings 8.5–10.0 mm.

Tribe HELOPHILINI Newman

Helophilites Newman, 1835, Grammar of Ent., pp. 193, 254.

Genus MERODON Meigen

Lampetia Meigen, 1800, Nouv. Class., p. 34. A rejected name.

Merodon Meigen, 1803, Illiger Mag. für Insektenkunde 2:274.

This is distinguished from other Hawaiian Eristalinae by having cell R_1 open in the wing margin and by the greatly thickened hind femora which bear prominent lateral apical projections. These are hairy, bee-like flies whose fleshy maggots cause extensive damage to *Narcissus*, daffodil, and other bulbs.

Type of genus: *Syrphus clavipes* Fabricius.

Merodon equestris (Fabricius).

Syrphus equestris Fabricius, 1775, Syst. Ent. 4:292.

For synonymy under this species, refer to Sack (1931:314).

The European narcissus fly.

Not known to be established in Hawaii.

This species is widespread over Europe and is established in New Zealand. It has been intercepted on many occasions at various ports in the United States in bulbs being shipped in from Europe. The larvae were intercepted at Honolulu by Whitney in 1920 (1921:606) in daffodil bulbs imported from the west coast of North America. The generic name has been misspelled "Mirodon" in our literature.

The species has been adequately described by Sack (1931:314). This is a moderately large, predominantly black, species. The thorax and abdomen are densely pilose. The pile on the anterior half of the mesonotum and the posterior half of the abdomen is orange, otherwise it is black.

Length of body: 11.0–14.0 mm.

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SUPPLEMENT TO VOLUME TEN

CORRECTIONS AND ADDITIONS

ERRATA

Inside the front cover: Indicate E. C. Zimmerman, author of previous volumes.

Under 6 read "Ephemeroptera" for "Ephemoroptera."

Under 7 read "Lycaenidae" for "Lycaiendae."

Under 8 read "Pyraloidea" for "Pyraliodea," and "Phycitinae" for "Physitinae."

Under 9 read "Microlepidoptera" for "Lepidoptera."

Under 10 read "Cecidomyiidae" for "Cedidomyiidae."

Preface, paragraph 3, line 2, read 13 for 14; bottom line on the page and in paragraph 3 on p. vi, C. F. Sabrosky and others of the U. S. National Museum dipterists should be listed Insect Identification and Parasite Introduction Research Branch, Agricultural Research Service, U. S. Department of Agriculture.

p. 1, line 31, read "Psychodidae" for "Psychopidae."

p. 7, line 7, read "Bombyliidae" for "Bobmyliidae."

p. 8, line 2 under Tipulidae, read "hawaiiensis" for "hawaiienses."

p. 10, line 5, read "wing" for "wings."

p. 22, line 1 of paragraph 2, read R. C. L. Perkins for C. L. Perkins.

p. 187, paragraphs 2 and 4, length of female, should read: body, .75 mm.; wings, .70 mm., not: body, 7.5 mm.; wings, 7.0 mm. Length of male should read: body, .85 mm.; wings, .80 mm., not: body, 8.5 mm.; wings, 8.0 mm.

p. 200, line 5, read "genotype" for "genotye."

p. 232, line 15 under Hyperlasion, read "Schmitz" for "Schmitg."

p. 310, line 7, read "*Neoexaireta*" for "*Noexaireta*."

p. 318, lines 9, 17; p. 319, line 3, read "Cephalochrysa" for "Cephlochrysa."

Since this volume was published several additional species have been accidentally introduced into the state; some new island records and additional information on habits are given.

CHECKLIST PSYCHODIDAE

p. 1, line 2 under Genus *Psychoda*, replace *hardyi* Quate with *quadrifilis* Edwards. These are synonyms.

p. 2, line 4, beneath *salicornia* Quate add *sigma* Kincaid. Mark an x under the Is-

land of Hawaii, and under other localities insert West Coast of North America.

_____ line 5, for *uncinula* Quate mark an x under the Island of Kauai.

_____ line 6, for *williamsi* Quate under other localities add Midway Atoll.

_____ following line 7 add Genus *Trichopsychoda* Tonnoir, remove the species *insulicola* Quate from *Psychoda* (line 1) and place it under *Trichopsychoda*.

CULICIDAE

p. 2, under *Aedes albopictus*, line 16, add *vexans nocturnus* (Theobald). Mark an x under Oahu, Kauai, and Molokai, and under other localities insert widespread throughout the Pacific region.

p. 2, line 18 should read *pipiens quinquefasciatus* Say.

p. 2, line 22, read *amboinensis* (Doleschall) for *splendens* (Wiedemann).

p. 22, line 7, read *amboinensis* (Doleschall) for *splendens* (Wiedemann).

p. 82, line 37, read *amboinensis* (Doleschall) for *splendens* (Wiedemann).

p. 85, lines 5, 7, 23 and 36 read *amboinensis* (Doleschall) for *splendens* (Wiedemann).

p. 86, lines 5, 32, 37 and 40, read *amboinensis* (Doleschall) for *splendens* (Wiedemann).

p. 87, line 6, read *Toxorhynchites amboinensis* (Doleschall) for *Toxorhynchites splendens* (Wiedemann).

p. 87, line 7, read *Culex amboinensis* (Doleschall), 1857, Natuurk. Tijdschr. Ned.-Ind. 14:381. for *Culex splendens* (Wiedemann), 1819, Zool. Mag. 1:2.

p. 87, line 8, read for synonymy see A. Stone, K. L. Knight and H. Starcke, 1959, A Synoptic Catalog of the Mosquitoes of the World. Thomas Say Found. Vol. 6, Baltimore, Md.: Horn-Shafer Co., p. 62.

p. 87, following line 8, add

Miss Mercedes D. Delfinado, University of Hawaii, has pointed out that the specimens sent to Hawaii from the Philippines were misidentified and that *amboinensis* is the species established here, not *splendens*. This has been confirmed by Dr. John N. Belkin, University of California, Los Angeles. In correspondence to Miss Delfinado he stated "According to the material before me, it seems definite that the species originally brought in by Dr. Hu from Manila is what has been called '*amboinensis*' in the Philippines. Whether this is true *amboinensis* remains to be seen, and I am afraid it will be a long time before we can obtain topotypic material from Indonesia for this purpose. Just why this was originally identified as *splendens* I don't know because the character of the color of the tufts of the 8th abdominal segment of the male is a very good one—red in *splendens*, black in '*amboinensis*'."

p. 87, line 11, read *amboinensis* for *splendens*.

p. 88, line 12, read *amboinensis* for *splendens*.

CERATOPGONIDAE

- p. 3, under subfamily Forcipomyiinae add Genus *Atrichopogon* Kieffer and the species *jacobsoni* (de Meijere). Mark an x under Oahu, and under other localities insert widespread over the Oriental and Pacific regions.
- _____ under *Forcipomyia* add * *picea* (Winnertz). Place an x under Oahu, and under other localities insert Europe, possibly Alaska or Canada.
- _____ add footnote, * indicates not known to be established in Hawaii.
- p. 4, following line 5 add subfamily Heleinae Speiser and beneath add Genus *Culicoides* Latreille and add * *variipennis* (Coquillett) with an x under Oahu, and under other localities insert widespread over the United States, Mexico and northern South America.
- _____ under *Dasyhelea calvenscens* mark an x under Hawaii, and under other localities insert Midway Atoll.
- _____ under *D. hawaiiensis* mark an x under Lanai.

SCIARIDAE

- _____ under *Sciara (Lycoriella) garretti* Shaw add record from Midway Atoll.
- _____ line 8, under other localities add Midway Atoll, also insert an x under Island of Hawaii.
- _____ line 9, mark an x under the Island of Lanai.

CECIDOMYIIDAE

- p. 5, line 28, change Brachyneurini to Heteropezini Schiner.
- _____ line 30, read *ulmi* (Felt) for sp. ? (near *ulmi* Felt).
- _____ line 31, read *Heteropeza* for *Oligarces* Meinert.
- p. 6, line 15, under *Giardomyia pallidithorax* Hardy add record from Midway Atoll.
- _____ line 27, under *Parallelodiplosis bimaculata* Hardy add record from Midway Atoll.

STRATIOMYIDAE

- p. 7, line 6, read *maxima* Bezzi for *hovas* (Bigot). Under other localities delete S. Asiatic and African Regions and in its place add Fiji and Samoa.

BOMBYLIIDAE

- _____ line 10, under *Anthrax distigma* Wiedemann mark an x under the island of Kauai.

INTRODUCTION

- p. 18, line 41, and p. 19, lines 26 and 38, read *Culex pipens quinquefasciatus* for *Culex quinquefasciatus*.
- p. 19, paragraph 4, it was mentioned that bird malaria was known only from Japanese hill robins at Kilauea, Hawaii. Since this was published, Mr. Richard E. Warner, Engineering Science, Inc., Oakland, California, has investigated

this disease and found it to be very prevalent in lowland areas on the island of Kauai. Erythrocytic forms of *Plasmodium* were demonstrated in several lowland species of introduced passerine birds, including the White-eye (*Zosterops palpebrosus japonicus*) and the Linnet (*Carpodacus mexicanus frontalis*). Experimental exposure of several highland-dwelling species of Drepanididae to the night-flying *Culex* mosquitoes of Kauai induced fatal infections of avian malaria in these endemic forms. He feels that this disease might have been responsible for decimating the native bird populations in the lowland; further that should the temperate subspecies of *Culex pipiens* become established in the upper regions of the remaining rain forests of Hawaii, those drepanidid species above the altitudinal distribution of the present vector will experience considerable diminution in numbers and possibly extinction in some cases.

- p. 23, fifth paragraph, line one, read five species of bot flies for four species; line two, add *Hypoderma bovis* (Linnaeus), the northern cattle grub. (This species is now a serious pest on several of the islands.)
- p. 28, add Sciomyzidae following Sepsidae. On line following Otitidae add Platystomatidae.

KEY TO FAMILIES

- p. 33, Sciomyzidae runs to couplet 26 with Lauxaniidae because of the presence of preapical dorsal bristles on the tibiae. This line should lead to couplet 26a, as follows:

26a. (26). Postocellar bristles convergent or crossing. Clypeus conspicuous, not hidden. **Lauxaniidae**
 Postocellars divergent, parallel, or absent. Antennae often strongly porrect. Clypeus retracted, vestigial, not visible. **Sciomyzidae**

- p. 33, Second portion of couplet 28 should key to 28a (delete Otitidae at this point).

Add following couplet:

28a. Veins R_1 and R_{4+5} haired above. Cubital cell not pointed. Arista plumose. Ocellar and postocellar bristles lacking **Platystomatidae**
 Vein R_{4+5} always bare, R_1 usually so. Cubital cell pointed. Arista bare or pubescent. Ocellar and postocellar bristles present **Otitidae**

TEXT

PSYCHODIDAE

- p. 71, In the key to *Psychoda*, *sigma* will run to couplet 6. Insert the following couplet:
6. First segment of palpus distinctly shorter than second (ratio 9:13).
 Subgenital plate of female heart-shaped (fig. 1a). Male dististyle small, poorly developed (fig. 1b)..... **sigma** Kincaid

First and second palpal segments subequal in length. Genitalia not as above.6a
(Substitute 6a for 6.)

- p. 73. *Psychoda hardyi* Quate has been placed as a synonym of *P. quadrifilis quadrifilis* Edwards (1928, Insects of Samoa, Diptera 2 (6):73). Refer to Quate, 1959, Insects of Micronesia, 12 (4):476. This species is distributed throughout the Marshall Islands, Caroline Islands, Samoa, and Hawaii.
- p. 76. *Psychoda insulicola* Quate should be placed in the genus *Trichopsychoda* Tonnoir which differs from *Psychoda* s. lat. by having microtrichia on the wing membrane. Members of this genus differ from *Philosepedon* Eaton by having the forks of veins R_{2+3} and M_{1+2} incomplete. Refer to L. C. Quate (1959, Ann. Ent. Soc. Amer. 52(4):446-447) for a complete discussion of this group.
- p. 78, following *Psychoda salicornia* Quate, insert:

***Psychoda sigma* Kincaid (fig. 1a-b).**

Psychoda sigma Kincaid, 1899, Ent. News, 10:31.

Hawaii. First recorded from Hawaii by Dr. L. C. Quate, May 1961 (1962, Proc. Haw. Ent. Soc. 18(1):12).

This species occurs along the West Coast of North America from Washington to California.

Type locality: Olympia, Washington.

Type in the California Academy of Sciences.

According to Quate (1955, Univ. Calif. Pub. in Ent. 10 (3):223) *P. sigma* is distinguished from other *Psychoda* by the fourteen segmented antennae, the small heart-shaped subgenital plate of the female (fig. 1a) and by the short dististyle and other characteristics of the male genitalia (fig. 1b). It also differs from related species by having the first segment of the palpus distinctly shorter than the second.

For a complete description refer to Quate, *loc. cit.*: 223-225, fig. 74a-d.

Length: wing of male, 1.7 mm.; wing of female, 2.1-2.6 mm.

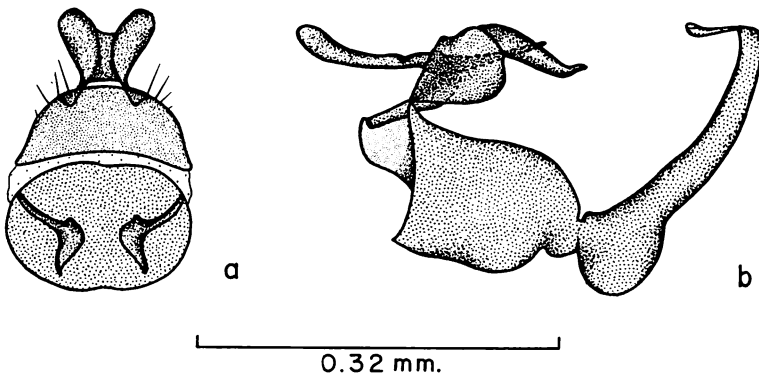


Figure 1—*Psychoda sigma* Kincaid; a, female genitalia; b, male genitalia.

- p. 78, under *P. uncinula* Quate, add record from Kauai. Refer to Quate (1962, Proc. Haw. Ent. Soc. 18 (1):21).
- p. 80, under *P. williamsi* Quate, add record from Midway Atoll. Refer to A. Suehiro (1960, Proc. Haw. Ent. Soc. 17(2):295).

CULICIDAE

Change *Culex quinquefasciatus* to the combination *Culex pipiens quinquefasciatus* Say on pp. 82 and 90 (refer to Stone, Knight and Starcke, 1959, A Synoptic Catalog of the Mosquitoes of the World, p. 254).

p. 89, the key to genera of adults should be modified. The second sentence of couplet 1 to read tarsi conspicuously banded.

p. 91, add *Aedes (Aedimorphus) vexans nocturnus* (Theobald).

———, under the genus *Aedes*, add:

KEY TO SUBGENERA OF AEDES

ADULTS

1. Mesonotum and head with conspicuous silvery white markings. Dististyle with an apical appendage. No basal lobe on basistyle. *Stegomyia* Theobald
- Mesonotum and head lacking silvery markings. Dististyle with a subapical appendage and basistyle with a basal lobe (fig. 3a). *Aedimorphus* Theobald

LARVAE

1. With an acus on the anal plate (fig. 3c), antennal hair with many branches (fig. 3b) *Aedimorphus* Theobald
- Lacking an acus on the anal plate. Antennal hair not branched. *Stegomyia* Theobald

Subgenus *Aedimorphus* Theobald

Aedimorphus Theobald, 1903, Mon. Cul. 3:290.

Reedomyia Ludlow, 1905, Can. Ent. 37:94.

According to R. L. Knight and W. B. Hull (1953, Pac. Sci. 17 (4): 453-454) members of this subgenus are predominantly brown with distinctive areas of silver scaling. They are related in general to *Stegomyia* but are distinguished by the form of the male palpus and of the dististyle of the male genitalia. The male palpi are longer than the proboscis and have numerous long hairs arising laterally and apically on the apical portion of segment three and all along segments four and five, rather than being relatively hairless as in *Stegomyia*. The basistyle has no true apical lobe and a basal lobe is present only in *A. vexans nocturnus* and the dististyle is greatly swollen apically except in *v. nocturnus*. The

Type of subgenus: *Aedimorphus domesticus* Theobald.

ADULT

- ## LARVAE

- This species is readily differentiated from other *Aedes* known from Hawaii by being predominantly brown, lacking silvery white markings on the thorax and head. It is separated from our only other known night biting species, *Culex pipiens quinquefasciatus*, by having pearly white bands on the tarsi, by the *Aedes*-like appearance (fig. 2), i.e., pointed abdomen, the presence of postspiracular bristles on the thorax; as well as other details.

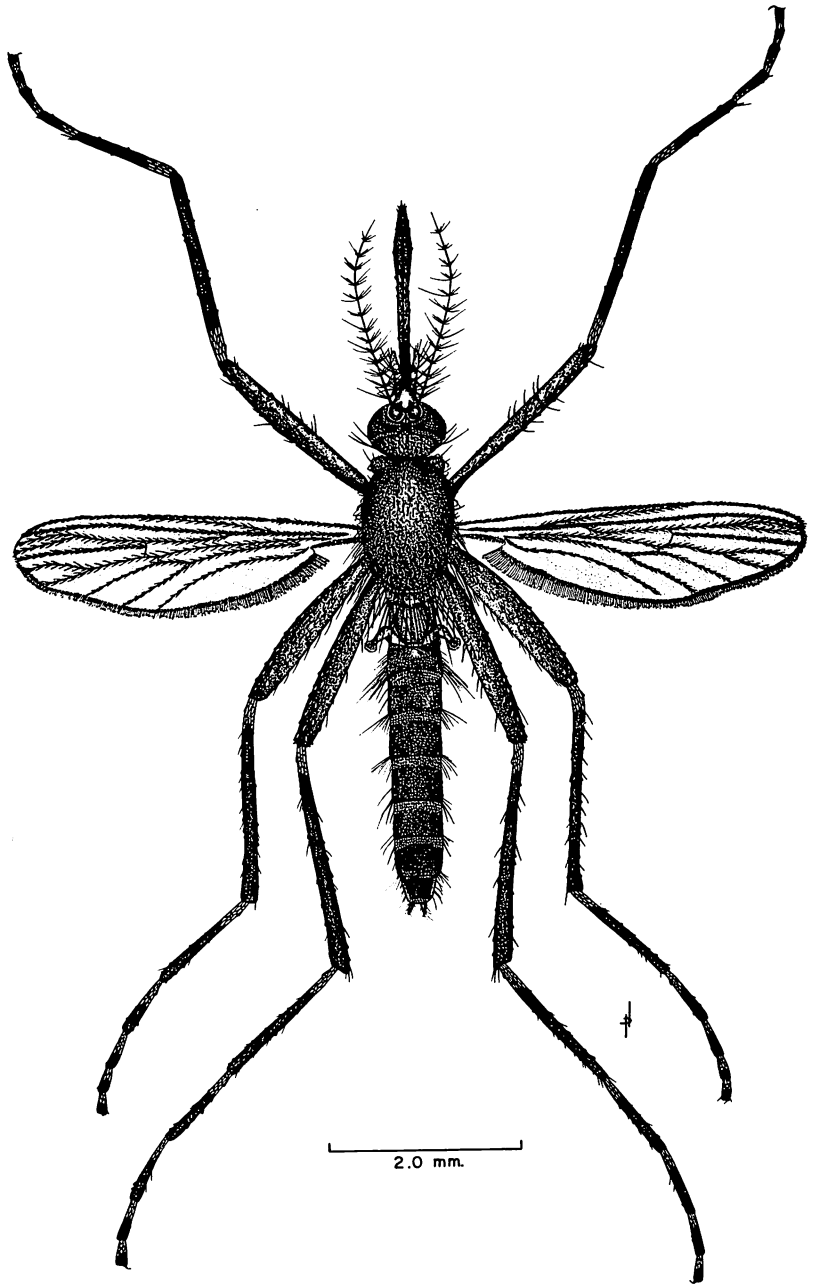


Figure 2—*Aedes vexans nocturnus* (Theobald) ; adult, dorsal view.

The thorax is predominantly brown, covered with bronze-colored scales, these are more yellowish on the posterior portion and on the scutellum. The pleura have patches of gray-white scales. The tibiae and tarsi are mostly iridescent blue-black with narrow basal white bands on the segments. The femora are speckled with black and white scales dorsally and pale ventrally. The abdomen is predominantly iridescent blue-black with a creamy-white basal band on each tergum. The male genitalia are as in figure 3a and the larval characters are as in figure 3b, c.

According to Dr. Alan Stone, Insect Identification and Parasite Introduction Research Branch, U. S. Department of Agriculture, the recognition of the subspecies *nocturnus* is difficult based upon adult specimens. The subspecies *vexans* is differentiated by having 3–5 branches on head hair 5 and 2–4 branches on hair 6; *nocturnus* has 1–3 branches on hair 5 and hair 6 is single.

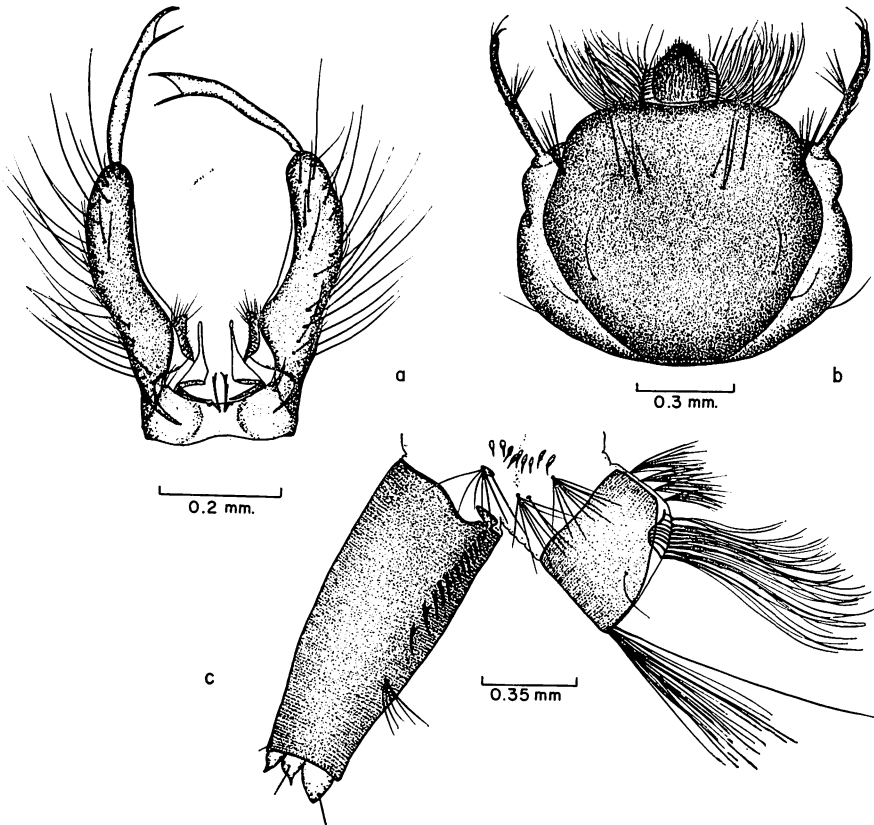


Figure 3—*Aedes vexans nocturnus* (Theobald); a, male genitalia; b, head of larva; c, posterior portion of larva.

CERATOPOGONIDAE

- p. 167, line 7, read four genera and three subgenera are known from Hawaii. These belong in three subfamilies.
- p. 167. Under key to Ceratopogonidae, add genus *Atrichopogon* Kieffer at end of first part of couplet 1.
 Insert couplet 2:
2. Costa elongate, extending to approximately the apical three-fourths of the wing. Second radial cell elongate many times longer than wide and first radial cell well developed (fig. 4a).....**Atrichopogon** Kieffer
 Costa not extending beyond the middle of the wing. Second radial cell about as long as wide and first radial lacking in Hawaiian species.**Forcipomyia** Kieffer
 Change couplet number 2 to 3 and 3 to 4.
- p. 168, line 11, read Two genera *Forcipomyia* Kieffer and *Atrichopogon* Kieffer and three subgenera, *Trichohalea* Goetghebuer, *Proforcipomyia* Saunders, and *Metaforcipomyia* Saunders, occur in Hawaii.
- p. 168, following discussion of subfamily Forcipomyiinae, add the following:

Genus *Atrichopogon* Kieffer

Ceratopogon (*Atrichopogon*) Kieffer, 1906, Ann. Soc. Sci. Brux. 30:p.7; 1906, Gen. Insectorum, fasc. 42:53.

?*Didymophleps* Weyenberg, 1863, Stett. Ent. Zeit., 44:108.

Dasyhelea (*Kempia*) Kieffer, 1913, Indian Mus. Rec. 9:162.

Gymnohelea Kieffer, 1921, Arch. Inst. Pasteur Afr. Nord, 1:115.

Lophomyidium Cordero, 1929, An. Mus. Hist. Nat. Montevideo, 3:94.

Psilokempia Enderlein, 1936, Tierwelt Mitteleur, 6 (16) :49.

Members of this genus are distinguished by having the empodium well developed; the r-m crossvein present; the costa comparatively elongate extending about two-thirds the wing length and both radial cells well developed (fig. 4a).

One species is now abundant in Hawaii.

Type of genus: *Ceratopogon levis* Coquillett, as *exilis* Coquillett.

***Atrichopogon jacobsoni* (de Meijere) (fig. 4 a-c).**

Ceratopogon jacobsoni de Meijere, 1907, Tijdschr. Ent. 50:212.

Atrichopogon flavellus Kieffer, 1913, Indian Mus. Rec. 9:177.

Atrichopogon immaculatus Kieffer, 1917, Mus. Nat. Hungarici, Ann. 15:181.

Atrichopogon cavernarum Edwards, 1924, Indian Mus. Rec. 26:107.

Atrichopogon jacobsoni (de Meijere), Edwards, 1928, Ins. Samoa 6 (2) :52.

Atrichopogon rarus Johannsen, 1946, B. P. Bishop Mus., Bull. 189:188.

Oahu. First reported in December, 1958, by Dr. C. R. Joyce (1959, Proc. Haw. Ent. Soc. 17 (1) :28.) from a male specimen collected in a light trap at

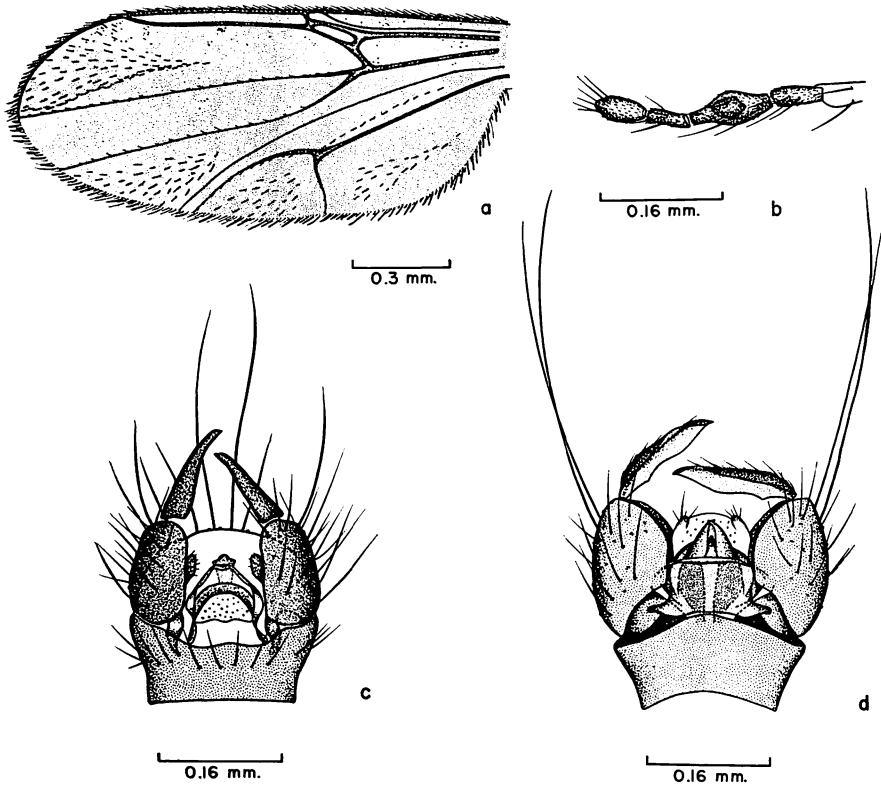


Figure 4—*Atrichopogon jacobsoni* (de Meijere); a, wing; b, palpus; c, male genitalia. *Forcipomyia picea* (Winnertz); d, male genitalia.

Fort Armstrong, Honolulu, August, 1958. Further reported by Joyce taken on several occasions during 1959 in light traps at Fort Armstrong and at the Honolulu International Airport (1960, Proc. Haw. Ent. Soc. 17 (2) 181.) This species is now widespread over the lowland areas of Oahu wherever suitable fresh-water habitats are available for it to breed. Dr. D. H. Habeck, University of Florida, found this attracted to lights in large numbers in Kaneohe, Oahu, and found specimens clustered by the thousands under banana leaves near a small stream in Kaneohe.

Immigrant. The species is widespread over the oriental and Pacific regions. Dr. W. W. Wirth, Insect Identification and Parasite Introduction Research Branch, U. S. Department of Agriculture, has a record of a specimen taken alive at Hickam Field in 1946, on a plane which had just returned from Guam. It is unlikely that it became established at the time since it apparently was not present here when I did my survey work for Volume 10.

Type locality: Semarang, Java.

Type in the Natural History Museum, Amsterdam.

This species cannot be confused with any other known ceratopogonid in

Hawaii; its all-yellow color, rather large size, wing venation (fig. 4a), sharply pointed mouthparts and male genitalia (fig. 4c) will readily differentiate it.

The scutellum has six to eight strong bristles and eight to ten small setae along the hind margin. In the male the wing membrane lacks macrotrichia.

The body averages 3.23 mm. and the wings 1.90 mm.

For complete descriptive details refer to M. Tokunaga and E. K. Murachi (1959, Insects of Micronesia, Diptera: Ceratopogonidae. B. P. Bishop Mus. Ins. Micronesia 12 (3) :120-123).

p. 169, modify key to *Forcipomyia*. Change second part of couplet 2 to lead to 3 and add the following couplet:

3. Parameres well developed, sharp-pointed at apices, extending three-fourths the length of the basistyle (fig. 4d).....
F. (*Forcipomyia*) *picea* (Winnertz)
 Parameres absent.....F. (*Proforcipomyia*) *ingrami* Carter
 Following key add:

Subgenus *Forcipomyia* Meigen

The following diagnosis of *Forcipomyia s. str.* is taken from L. G. Saunders, 1956, Can. Journ. Zoo. 34:659-660:

"Segments 3-10 of female antenna flaskshaped, never compressed, with two hyaline sensory hairs; segment 11 as long as 10 or longer. Wings densely clothed with macrotrichia; costa never beyond middle of wing; second radial cell short. Parameres always present in male genitalia, variable in form, joined broadly or narrowly at base, attached to diagonal basistylar apodemes. Spermathecae two."

This would fit into the generic key, p. 167, by replacing number 3 with 4 and inserting the following as couplet 3:

3. Parameres absent or fused at apices.....4
 Parameres distinctly separated at apices (fig. 4d).....
*Forcipomyia* (*Forcipomyia*) Meigen

Forcipomyia (*Forcipomyia*) *picea* (Winnertz) (fig. 4d).

Ceratopogon piceus Winnertz, 1852, Linnaea Entom. 6:21.

A male specimen collected by Dr. C. R. Joyce, April, 1961 (1962, Proc. Haw. Ent. Soc. 18(1):9) was studied by Dr. W. W. Wirth who said it "appears to be the European *F. picea* (Winnertz), a common species breeding under tree bark." He said that the male genitalia are indistinguishable from those of *F. simulata* Walley from the Northwestern U. S. and Canada. "However, our pinned specimens of *simulata* are paler and much smaller than your specimen which is in the size range and darker like *picea*. I suspect that your specimen came from an intro-

duction in unpeeled logs from Alaska or Canada." No further specimens have been seen from Hawaii.

Immigrant. Europe. Possibly occurs in Alaska or Canada.

A large densely black pilose species. The thorax is entirely black, rather densely gray pollinose. The abdomen is subshining black, narrowly marked with yellow on the posterior lateral margins of the terga. The legs are entirely brown to black, densely long black-haired especially on the dorsal surfaces of the tibiae. The male genitalia are distinctive, the well-developed parameres will distinguish it (fig. 4d).

Length: body, 3.2 mm.; wings, 2.5 mm.

The larval and pupal stages of this species have been discussed in detail by J. G. H. Frew (1923, Ann. Appl. Biol., Cambridge 10:409-441).

p. 173, under *Forcipomyia ingrami*, end of line 13, add this species was reported biting man in the Waianae Mountains, Oahu, by D. Lupton (1962 Proc. Haw. Ent. Soc. 18 (1): (8).

p. 181, preceeding subfamily Dasyhelinae, insert the following:

Subfamily HELEINAE Speiser

Heleinae Speiser, 1910, Zool. Jahrb., Suppl. 12:735.

This group is differentiated by having one or both anterior radial cells well developed; the second extending beyond the middle of the wings and square at the apex.

Genus CULICOIDES Latreille

Culicoides Latreille, 1808, Gen. Crust. et Ins., 4:251.

Oecacta Poey, 1851, Mem. Hist. Nat. Isla Cuba, 1:236.

Psychophaena Philippi, 1865, Verh. Zool.-Bot. Ges. Wien, 15:628.

Haematomyidium Goeldi, 1905, Mem. Mus. Goeldi, 4:137.

Cotocripus Brethes, 1912, Ann. Mus. Nac. Buenos Aires, 22:451.

Haemophoructus Macfie, 1925, Bull. Ent. Res., 15:349.

Synhelea Kieffer, 1925, Arch. Inst. Pasteur d'Algérie, 3:423.

Prosapelma Kieffer, 1925, Arch. Inst. Pasteur d'Algérie, 3:417.

Hoffmania Fox, 1948, Proc. Biol. Soc. Wash., 61:21.

The members of this genus are distinguished by having a prominent pit behind each humerus; the tarsal claws small, simple and equal in both sexes; the empodium small, vestigial; wings with dense microtrichia, usually with abundant macrotrichia and often with distinctive dark markings. The costa extends beyond the middle of the wing and the two anterior radial cells are approximately equal (fig. 5c).

Type of genus: *Culex pulicaris* Linnaeus, as *Culicoides punctata* Latreille.

This genus (and the species *variipennis*) could fit into the key on p. 167 by

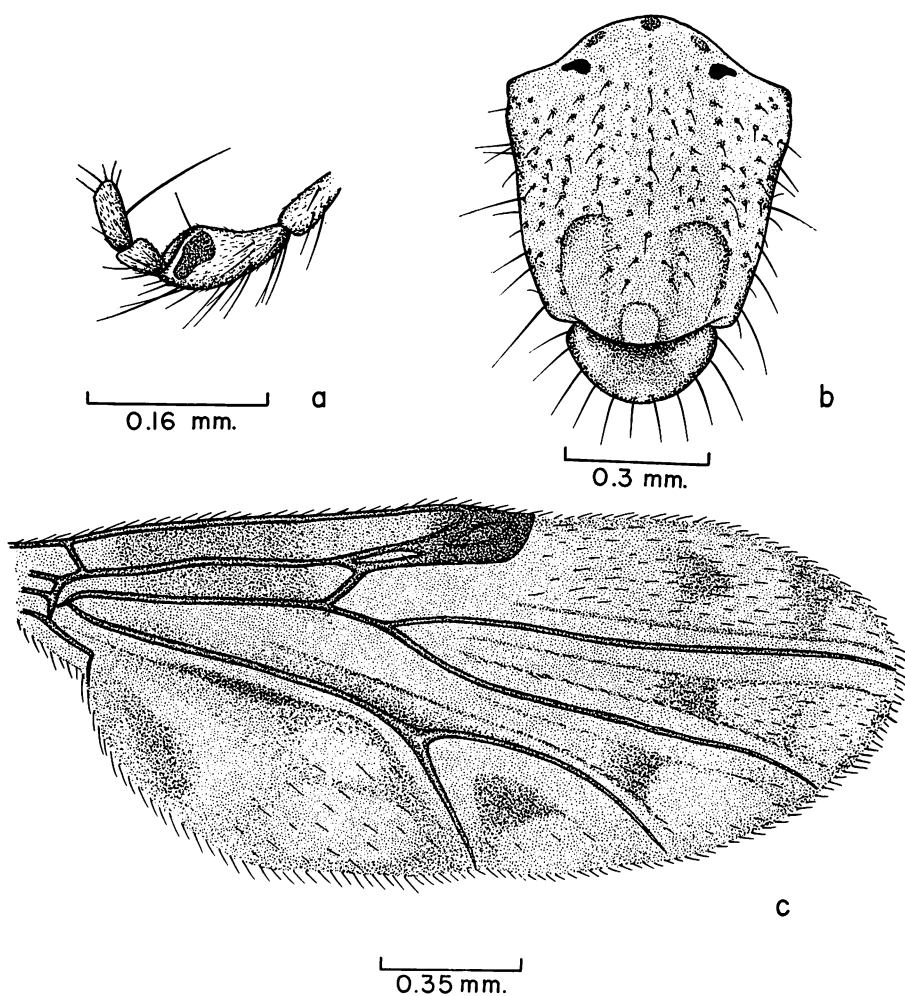


Figure 5—*Culicoides variipennis* (Coquillett) ; a, palpus; b, mesonotum; c, wing.

putting the following couplet in place of 1 and advancing by one the other couplet numbers:

1. Wings marked with brown (fig. 5c). Mesonotum gray, speckled with brown (fig. 5b). Humeral pits well developed
 Subfamily **Heleinae**, Genus **Culicoides** Latreille
- Not as above 2

Culicoides variipennis (Coquillett) (fig. 5a-c).

Ceratopogon variipennis (Coquillett), 1901, Proc. U.S. Nat. Mus., 23:602.

Culicoides variipennis (Coquillett), 1906, Gen. Insectorum, fasc. 42:55.

One female specimen was taken in a light trap collection at Fort Armstrong,

Honolulu, November 12, 1959, by Dr. C. R. Joyce (1960, Proc. Haw. Ent. Soc. 17 (2):181; the name was misspelled "variipennis.") . It has never been reported since and this species is apparently not established in Hawaii.

Distribution: Widespread over the United States, Mexico, and northern South America.

Type locality: Richmond, Virginia.

Type in the U.S. National Museum.

According to Wirth (1952, Univ. Calif. Pub. in Ento. 9 (2):180-181) this species belongs in the *nubeculosus* group by having the inner process of the male dististyle greatly reduced; the aedeagus more or less forked at the apex; the parameres completely fused proximally; and the female spermatheca single. It is "a large bluish-gray pruinose species with brown markings, mesonotum with many small brown dots; wing irregularly streaked with brown and gray; legs banded." It is readily differentiated from any known Hawaiian ceratopogonids by the brown markings on the wings (fig. 5c); the gray mesonotum speckled with brown (fig. 5b); the enlarged third segment of the palpus (fig. 5a); and by the banded legs.

Length: body, 2.4 mm.; wing, 2.2 mm.

For a complete description refer to W. W. Wirth (1952, Univ. of Calif. Pub. in Ento. 9 (2):180-182). For treatment of the subspecies of *variipennis* refer to W. W. Wirth and R. H. Jones (1957, U. S. Dept. Agric. Tech. Bull. 1170:35pp.).

Although there are few records of *variipennis* feeding on man, it is reputed to be a very serious pest of domestic animals and may be responsible for the transmission of several diseases of lower animals. It is a prolific breeder and is able to adapt to a wide range of aquatic habitats from fresh water, sewer-polluted ditches or septic tank effluents, salt or alkaline water. For a discussion of larval habitats refer to R. H. Jones (Ann. Ent. Soc. Amer. 54 (5):702-710).

p. 182, under *Dasyhelea calvescens* Macfie, add record from Midway Atoll. Refer to A. Suehiro, *loc. cit.* Also add record for the Island of Hawaii.

p. 184, under *D. hawaiiensis* Macfie, add record of this species being reared from flower heads of *Broussaisia* which were heavily infested with native mealybugs, collected on Lanaihale, Lanai, 3,600 feet, January 1962 (J. W. Beardsley). Williams (1944:176-178) had previously found this species breeding on wet banks in the mountains, among algae in flowing streams and in leaf axils of *Dubautia*.

SCIARIDAE

p. 221, under *Sciara (Lycoriella) garretti* Shaw, add record for Midway Atoll. Refer to A. Suehiro, 1960, Proc. Haw. Ent. Soc. 17 (2):296.

CECIDOMYIIDAE

p. 257, under *Mycophila fungicola* Felt, refer to redescription and review of biology by R. H. Foote and C. A. Thomas, 1959, Ann. Ent. Soc. Amer. 52 (3):

- 331–334. This is apparently a common pest of mushrooms in eastern United States.
- p. 265, under *Oligarces* sp. ?, this is *O. ulmi* Felt (1911, Jour. Econ. Ent. 4:477) and has been placed by Pritchard (1960, Ann. Ent. Soc. Amer. 53:311) in the combination *Heteropeza ulmi* (Felt) under the tribe Heteropezini.
- p. 281, under *Arthrocnodax walkeriana* Felt. This species has previously been reported as a predator on mealybugs; I have reared specimens from palm fruits which were heavily infested with mites (Hardy, 1961, Proc. Haw. Ent. Soc. 17 (3):322).
- p. 289, under *Giardomyia pallidithorax* Hardy, add record from Midway Atoll. Refer to A. Suehiro, 1960, Proc. Haw. Ent. Soc. 17 (2):296.
- p. 300, under *Parallelodiplosis bimaculata* Hardy, add record from Midway Atoll. Refer to A. Suehiro, *loc. cit.*

STRATIOMYIDAE

- p. 311, under *Neoexaireta spiniger* Wiedemann, also under *Evaza javaensis* de Meijere, p. 317. I have reared these species from rotten banana stumps at Pupukea, Oahu, June, 1958.
- p. 313, under *Brachycara latifrons* James, add notes on habits by G. D. Butler (1961, Proc. Haw. Ent. Soc. 17 (3):331–332) who made careful observations of this species on Laysan Island.

“Adult flies were observed in July, 1959, on various parts of Laysan, but they were most abundant in the *Heliotropium*, *Sesuvium* and *Cyperus* around the lagoon . . . They rested head down on the stems of the plants in the shade with their wings folded. In one location an average of one fly per sweep was collected in 10 sweeps of a 12-inch insect net, but they were not generally that abundant.

“The larvae were found beneath dead young albatrosses which were particularly abundant in and around the lagoon. Most of the observations were made in the vegetation-free lagoon area, the surface of which was covered by dry algae and salt. *B. latifrons* appeared to prefer the older bird carcasses. Unlike the dermestids (*Dermestes cadaverinus* Fabricius) and various other flies which were found in large numbers beneath the center of rather fresh moist carcasses, the larvae of this fly preferred the outer areas, such as beneath the comparatively dry wings. They were found in large numbers upon some of the old dry carcasses which appeared to be no longer attractive to the other scavengers. Under these dry carcasses there were as many as five or more larvae per square inch, but, in general, the larval population was variable from carcass to carcass and under different portions of the same carcass. The puparia were also found under the carcasses and were most abundant on the ground around the margin.”

- p. 318, *Cephalochrysa hovas* (Bigot) should be corrected to *C. maxima* (Bezzi) (1928, Diptera Brachycera and Athericera of the Fiji Islands, p. 33) according to information received from Dr. M. T. James, in correspondence. This has been recorded from Fiji and Samoa. The type is in the British Museum (Natural History) collection.

BOMBYLIIDAE

- p. 321, under *Anthrax distigma* Wiedemann, add new record for Island of Kauai. Refer to Bianchi, 1961, Proc. Haw. Ent. Soc. 17 (3) :325.

SCENOPINIDAE

- p. 326, under *Lucidomphrale lucida* (Becker), also p. 329, under *Scenopinus adventicia* Hardy, add the note that considerable numbers of adults of both of these species were collected on *Atriplex* infested with beet leafhoppers, *Circulifer tenellus* (Baker) at Waipio Peninsula, Oahu, April, 1960. Actual predation on the leafhoppers was not observed.

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